

THE MARINE REVIEW

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No. 22

Naval Architects and Marine Engineers.

The fourteenth annual meeting of the Society of Naval Architects and Marine Engineers was held in the quarters of the American Society of Mechanical Engineers, No. 12 West 31st street, New York, on Nov. 22 and 23 and was unusually well attended, members being present from all parts of the country. President F. I. Bowles presided. The report of Naval Constructor W. J. Baxter, secretary and treasurer, showed the society to be in excellent condition. The society's membership is 857 as against 862 for November last year, exclusive of thirty-seven just elected. The receipts during the year were \$10,395.54, and expenses, \$10,130.94. The society has no liabilities and its present wealth is \$24,895.20. The members stood while Secretary Baxter read the list of those who had died during the year, as follows:

Hobart Canfield,	David M. Greene.
W. R. T. Jones,	John C. Kafer,
E. L. Levy,	Benjamin H. Warren,
A. G. Wilson,	Joseph I. Woodward,
B. H. Buckingham,	Joseph McCreery,
W. H. Vanden Doorn,	H. C. Watts.

At the meeting of the council last July, D. W. Taylor and W. L. Capps were made vice presidents which selection was ratified by the society as was also the election of Harvey D. Goulder and J. S. Hyde as associate members. The new members of the council are W. J. Baxter, Guy W. Dickie, W. M. McFarland, W. D. Forbes, Andrew Fletcher, Lewis Nixon, J. S. Hyde and J. W. Miller.

Mr. Charles H. Haswell, the dean of American engineers, now in his ninety-eighth year, was among the distinguished men at the meeting.

The following new members were admitted.

LIFE ASSOCIATE MEMBER.
Cornelius Vanderbilt, 30 Pine street, New York.

PROMOTION TO MEMBER.
L. H. Chandler, lieutenant commander, U. S. Navy Dept., Washington, D. C.

MEMBERS.
Wm. T. Donnelly, consulting mechanical engineer, 780 E. 18th street, Flatbush, Brooklyn.

R. T. Hall, commander, U. S. Navy, Navy Department, Washington, D. C.
Georges Hart, chief engineer, 99 Rue La Fayette, Paris.

John J. Herrick, mechanical engineer, Dept. Docks and Ferries, 27 Madison avenue, Tompkinsville, S. I.

Andrew Laing, director and general manager, The Wallend Slipway & Engineering Co., Wallend-on-Tyne, England.

Robert McGregor, supt. engineer, Metropolitan S. S. Co., India Wharf, Boston, Mass., 55 Vernon street, Brookline, Mass.

William T. Nevins, superintendent of construction, Sherman Co., Chicago, Ill.

F. S. Nock, naval architect, East Greenwich, R. I.

Antonio C. Pessano, president, Great Lakes Engineering Works, Detroit, Mich.

O. C. Roeder, consulting engineer, 38 Klau-precht street, Karlsruhe, Germany

Joseph A. Scott, naval architect, 95 Liberty street, New York.

Charles Skentelbery, consulting engineer, Jacobs, Davies & Barringer, 95 Milk street Boston, Mass.

A. C. Smith, general superintendent, Chicago Shipway Co.

Dwight True, chief hull draftsman, Great Lakes Engineering Works, Detroit, Mich.

William E. Waterhouse, naval architect and engineer, 15 Whitehall street, New York.

Llewellyn Williams, superintendent of refrigeration, United Fruit Co., 131 State street, Boston, Mass.

Alexander Hylal, Nacey & Hynd, Cleveland, FOR ASSOCIATE.

Captain Edward B. Barry, U. S. N., care of postmaster, New York.

Captain R. D. Bucknam, U. S. embassy, Constantinople, Turkey.

Arthur T. Chester, The Aeolian Co., 362 Fifth avenue, New York.

Maxwell W. Day, assistant engineer, power and mining department, General Electric Co., Schenectady, N. Y.

W. A. Engeman, president, Benvenue Granite Co., 41 Park Row, New York.

W. B. Fogarty, assistant naval constructor, U. S. N., Navy Yard, Portsmouth, N. H.

Adrian Gips, general agent, Holland-America line, 39 Broadway, New York.

Richard Henderson, captain, U. S. N., Salisbury, N. C.

William F. Piek Jr., Holland-America line, Rotterdam, Holland.

H. Raouf, I. O. N., British P. O., Constantinople, Turkey.

Walter H. Singer, general manager, Singer Dock Co., Duluth, Minn.

J. A. Spillman, assistant naval constructor, U. S. N., Navy Yard, Norfolk, Va.

Henry R. Sutphen, vice president and general manager, Electric Launch Co., Bayonne, N. J.

S. B. Thomas, lieutenant, U. S. N., Torpedo Station, Newport, R. I.

FOR JUNIOR.
Jos. Barraja-Frauenfelder, naval architect, Quincy, Mass.

Daniel M. Callis, estimator, scientific department, Maryland Steel Co., Sparrow's Point, Md.

Francis J. French, ship draftsman, C. and R. department, New Orleans, La.

Dwight S. Simpson, naval architect.

William L. Wallace Jr., professor naval architecture, Cornell University.

Daniel I. Whittelsey, superintendent, Williams-Whittelsey Co., Steinway, L. I. City.

A feature of these annual meetings has been the annual address of President F. I. Bowles. The present one was the most significant and hopeful that he has ever delivered. He sees the deliverance of American shipping on the high seas in the near future. President Bowles' address was as follows:

"The affairs of your society are set forth in the report of the secretary-treasurer, adopted by the council, and while generally in satisfactory condition, the society's membership, exclusive of the 37 elected this morning, standing at 857, shows a slight reduction for the year. The financial condition of the society is satisfactory, and shows a slight improvement during the year, the society's total resources amounting to \$24,895. A matter calling for remark is the large amount owing for delinquent dues, amounting to \$6,054. This is evidence of a continued depression in the ship building industry, and it has been the policy of the society's management to deal leniently with it, anticipating or trusting that the majority of its delinquent members will desire and do desire to continue their membership.

"While the government's record of commercial ship building for the past fiscal year indicates a pitifully small showing of steel construction on the seaboard, it is a gratification to the chair to be able to indicate a great improvement for the coming year and evidences of a more satisfactory showing for ship building generally

than has ever taken place in the life of this society. During the fiscal year ending June 30, 1906, the United States built and documented 1,221 vessels including canal boats and barges of 418,745 gross tons, compared with 1,102 vessels of 330,316 gross tons for the previous year. The steel steam tonnage was 118,790 gross tons greater than during the previous fiscal year, and all other forms of construction together show a decrease. On the seaboard, only three steamers of 15,344 tons were built and 10 vessels of 16,681 for river and bay service. On the great lakes the majority of the tonnage was built, consisting almost wholly of large steam cargo vessels, 40 in number and amounting to 232,366 tons. During the current fiscal year, vessels have been begun on the lakes indicating even greater activity than for last year, and orders have been given for vessels on the seaboard for the coast trade indicating a considerable demand for steel steam tonnage for that service, and it is probable that the output of merchant vessels almost wholly in steam vessels for the year 1907 will exceed the greatest amount ever built for one year in the United States, namely: 1855, when 583,450 tons were constructed.

"On July 1, 1906, 78 merchant vessels of 159,000 tons were under construction on the coast against 49 of 86,000 the year preceding. Of these 78 vessels, only two will engage in foreign trade, and these are to take the place of two steamships bought by the government for its line to the Isthmus of Panama.

"On the lakes 40 vessels of 223,000 tons were under construction on July 1, against 27 vessels of 104,000 tons last year.

"It is gratifying to be able to predict, confidently, that we in the United States shall not be much longer subject to the reproach that our tonnage in the foreign trade is less now than it was one hundred years ago. The bill prepared by the merchant marine commission for the development of foreign commerce under the American flag, passed the senate of the United States at the last session of congress, and is now before the committee on commerce of the house of representatives, at whose hearings during the last session much favorable comment was developed from widely diversified interests throughout the United States.

"Elihu Root, that distinguished citizen of New York, now secretary of

state, has recently returned from a trip around South America, and after making a careful study of our commercial relations, has become convinced of the methods which should be followed in developing our commerce with that great country. He has expressed his judgment upon the bill of the merchant marine commission in no uncertain terms, and I quote with pleasure from his address before the Trans-Mississippi Commercial congress in Kansas City, on Nov. 20. After reciting the now unquestioned fact of the subsidies paid by other maritime nations to their steamship lines he says:

It is estimated that about \$28,000,000 a year is paid by our commercial competitors to their steamship lines. Against these advantages to his competitor the American ship owner has to contend; and it is manifest that the subsidized ship can afford to carry freight at cost for a long enough period to drive him out of business. We are living in a world not of natural competition but of subsidized competition. State aid to steamship lines is as much a part of the commercial system of our day as state employment of consuls to promote business.

It will be observed that both of these disadvantages under which the American ship owner labors are artificial; they are created by governmental action; one by our own government in raising the standard of wages and living, by the protective tariff, the other by foreign governments in paying subsidies to their ships for the promotion of their own trade. For the American ship owner it is not a contest of intelligence, skill, industry and thrift against similar qualities in his competitors; it is a contest against his competitors and his competitors' governments and his own government also.

Plainly these disadvantages created by governmental action can be neutralized only by governmental action, and should be neutralized by such action.

"He then discusses the remedies proposed, and after a careful discussion of the suggestion of free ships and discriminative duties which he rejects, the former as inexpedient, which would merely sacrifice the American ship building industry and the latter as one which cannot be seriously considered from its interference with existing commercial treaties and relations, he says:

There remains the third and obvious method—to neutralize the artificial disadvantages imposed upon American shipping through the action of our own government and foreign governments by an equivalent advantage in the form of a subsidy or subvention. In my opinion, this is what should be done; it is the sensible and fair thing to do. It is what must be done if we would have a revival of our shipping and the desired development of our foreign trade. We cannot repeal the protective tariff; no political party dreams of repealing it; we do not wish to lower the standard of American living or American wages. We should give back to the ship owner what we take away from him for the purpose of maintaining that standard; and unless we do give it back we shall continue to go without ships. How can the expenditure of public money for the improvement of rivers and harbors to promote trade be justified upon any grounds which do not also sustain this proposal? Would anyone reverse the policy that granted aid to the Pacific railroads, the pioneers of our enormous internal commerce, the agencies that built up the great traffic which has enabled half a dozen other roads to be built in later years without assistance?

Such subventions would not be gifts. They would be at once compensation for injuries inflicted upon American shipping by American laws and the consideration for benefits received by the whole American people—not the shippers or ship builders or the sailors alone, but every manufacturer, every miner,

every farmer, every merchant whose prosperity depends upon a market for his products. The provision for such just compensation should be carefully shaped and directed so that it will go to individual advantage only so far as the individual is enabled by it to earn a reasonable profit by building up the business of the country.

"During the past year, the American ship builders have undertaken the introduction of the coming motive power—turbine machinery. The first vessel for coast service equipped with turbine engines, has recently made her successful trial under the construction of one of the ablest and most popular members of this society. The navy department has contracted for two scout vessels with turbine engines, and is apparently about to introduce turbine engines in battleships. Other turbine vessels for coast service have been contracted for and will be delivered at an early date.

"American ship builders have reason to be proud of the naval vessels completed during the past year. The number of first class vessels, battleships and armored cruisers completed and accepted during the past year, has been exceptionally large, but the amount of new tonnage begun or authorized shows a great falling off. It is anticipated by members of our society that the developments in marine engineering during the past year will exercise a marked effect on new naval construction.

"With these few remarks," said President Bowles, stepping down from the chair, "I offer up my office and thank you for your continued confidence."

Secretary Baxter then announced that the council had recommended that President Bowles be re-elected president for the next three years. This was unanimously done and Stevenson Taylor, G. W. Dickie and J. H. Linard were appointed a committee to so notify Mr. Bowles.

Lieut. Commander Naomi Tanaguchi, of the imperial Japanese navy, at present naval attaché at the Japanese embassy, Washington, was constant in his attendance at the sessions. At the morning session Mr. J. R. Andrews called the society's attention to the magnificent effort which Secretary of State Root was making in behalf of the merchant marine of the United States, and moved that a committee be appointed to draft suitable resolutions commending him. It is interesting to relate that Mr. Charles H. Haswell who was made chairman of this committee, personally revised the resolutions after they had been drafted and made alterations in them with his own hand, which greatly improved the language. This copy of the resolu-

tions with the interlineations in his own handwriting and signed by him will be framed and preserved by the society. The resolutions read as follows:

"Whereas, the Society of Naval Architects and Marine Engineers, now holding its annual session in New York city, has read with great pleasure the recent address of the honorable, the secretary of state, before the trans - Mississippi Commercial Congress, now in session at Kansas City, Missouri; and

"Whereas, this address has fully and admirably pointed out the various steps necessary to secure an increase of foreign trade; and

"Whereas, an increase of foreign trade means an increase of prosperity for the farmer and the manufacturer, as well as an increase in the mercantile marine to transport these products, and increased prosperity for the ship building industry, in providing vessels for this trade, in the last two items of which the members of this society are vitally interested;

"Now, therefore, be it resolved: That the Society of Naval Architects and Marine Engineers desires to express its sincere thanks to the honorable, the secretary of state, for his masterly presentation of the subject, and to place on record its belief that he has given a marked impetus to a movement which we believe to be of the greatest importance to the general prosperity of the country.

"Chas. H. Haswell, chairman; J. R. Andrews, H. L. Aldrich, George W. Dickie, W. M. MacFarland, W. A. Post."

The banquet at Delmonico's on Friday evening, which closed the sessions was a brilliant affair and was the best attended banquet that the society has held in years. The first thing done was to drink Mr. Haswell's health standing. The principal speaker was Mr. Charles J. Bonaparte, secretary of the navy, who frankly stated that he took back everything that he had said in his last annual report and now believed in a naval force commensurate with the greatness and responsibility of the country and a merchant marine commensurate with such a force.

President Bowles said that he had reason to believe that the time would speedily come when it would be no longer possible to say that the United States had almost as much tonnage in the foreign trade a hundred years ago as it has now. He considered that a shameful record but believed it would not exist much longer and never exist again.

He then introduced Mr. John Craig, of Toledo, who made a most incisive and excellent address, stating that the country had imposed a tariff on everything in the ship and had left it, burdened with excessive cost, to compete without assistance with lower-priced ships of other nations. He hoped the day would never come when the tariff, which had meant so much to the prosperity of the United States, would be disturbed but at the same time he regarded it as manifestly unfair that its blessings should be withheld from ship owning in the foreign field. Under the protection of the coastwise laws, ships have grown from 600 tons to 12,000 tons in thirty years on the great lakes and freight had fallen from \$8 a ton to 75 cents. What had been done on the lakes could be done on the high seas as well. He was ashamed of his country's attitude towards shipping in the foreign trade but predicted that if protection was extended to that field we would in fifteen years be building ships for England.

Rear Admiral Coghlan made a happy speech in which he spoke of the need of the development of the merchant marine.

Col. Thompson contrasted English naval and merchant marine methods with those of the United States to the great disadvantage of the United States. He spoke of the incessant drilling of the personnel in the British navy to educate commanders, saying that it took practically a lifetime to make a leader. He pointed to the fact that the Dreadnought went into commission exactly one year after the drawings were submitted to the builders, whereas the Connecticut, launched nearly two years ago, is still lying at the Brooklyn navy yard because there are no men to send her to sea. He considered the condition of the navy to be one of absolute danger, saying that the older men are retiring every few months with no men coming up to take command, practically every one of them having reached the age of fifty-five years in subordinate positions. He thought the public should be informed and a navy league maintained similar to that of England's.

Naturally this statement could not go unchallenged, President Bowles saying that there were plenty of competent men in the navy and asking Congressman Laudenslager, of New Jersey, to talk upon that subject. Laudenslager said that he had given many years' study to the needs of the navy department and was in favor of a navy that measured up with the country's stature as a nation. He felt

also that a merchant marine of similar proportions should be had. Emphatically he stated that he believed the navy department had a competent personnel and Admiral Capp also said so.

Lewis Nixon thought we needed a great navy but that it needed also something to protect. He referred to the smallness of the country's merchant marine and declared that the shipping measure was a national and not a party question. Nor did he think that the time would ever come when the men of the navy would fail to rise fully to the occasion.

In a very gracious way also Mr. Wm. MacFarland took issue with Col. Thompson, stating that he had given a great many years of his life to the navy and that he was sure it was full of competent men.

Among the members who attended were: F. T. Bowles, D. W. Taylor, W. J. Baxter, W. P. Stephens, John Craig, George Craig, W. D. Forbes, J. F. Meigs, A. J. McLean, W. I. Babcock, D. W. Cox, Prof. C. H. Peabody, F. Merriam Wheeler, Stevenson Taylor, J. H. Andrews, C. H. Haswell, W. W. Smith, Alexander Hynd, Simon Lake, F. L. Du Bosque, William Gatewood, Prof. H. C. Sadler, George W. Dickie, W. M. MacFarland, J. W. Miller, F. D. King, W. P. Roberts, R. C. Monteagle, J. H. Linnard, Carl C. Thomas, Charles E. Hyde, J. A. Furer, H. L. Aldrich, H. C. Capdeville, R. W. Wright, Daniel Whittlesey, Thomas E. Webb, Wassily W. Wassilieff, Arthur L. Terry, E. A. Stevens, J. G. Purdy, William J. Norton, A. M. Merrill, S. D. McComb, Lewis H. Kenny, D. E. Ford, Fred A. Hunnewell, Francis G. Hall, William M. Finkenane, George P. Wilson, Chauncey G. Whiton, George A. White, C. M. Wales, Richard C. Veit, Alfred A. Thresher, Lawrence Y. Spear, Henry R. Sutphen, Anson Phelps Stokes, Frank J. Sprague, H. S. Snyder, Alfred Gilbert Smith, William H. Phillips, Hugh Pattison, C. B. Orcutt, Marston Niles, W. H. Millard, C. E. Littlefield, James J. Lynn, J. W. Kellogg, M. L. Katzenstein, A. Johnston, John S. Hyde, H. G. Hebbinghaus, John J. Amory, James G. Winship, Henri Wilkinson, W. Carlisle Wallace, Frank Van Vleck, E. Platt Stratton, Francis B. Smith, A. Cary Smith, John R. Sherwood, Thomas F. Rowland Jr., Thomas Fitch Rowland, Edwin P. Robinson, E. E. Roberts, Francis E. Pratt, W. A. Post, Charles D. Mosher, H. A. Magoun, William Hovgaard, Charles H. Haswell, W. D. Dickey, W. G. Coxe, D. H. Cox, G. W. Gardiner, J. Cox, L. Katzenstein,

J. Katzenstein, M. Katzenstein, William Katzenstein, J. B. Edson, W. T. Donnelly, H. C. Higgins, D. Almy, A. B. Corthell, W. H. Bailey, F. E. Pratt, C. W. Martin, J. A. Scott, G. K. Bradfield, E. A. Perham, Simon Lake, F. L. Fernald, J. Loyd, G. Weed, J. D. Williamson, C. E. Ross, Harvey D. Goulder and T. F. Newman.

READING AND DISCUSSION OF PAPERS.

The two papers, "A Fireproof Ferryboat" by F. L. Du Bosque and "Construction of a Fireproof Excursion Steamer" by William Gatewood were read and discussed jointly. Mr. Du Bosque's paper was as follows:

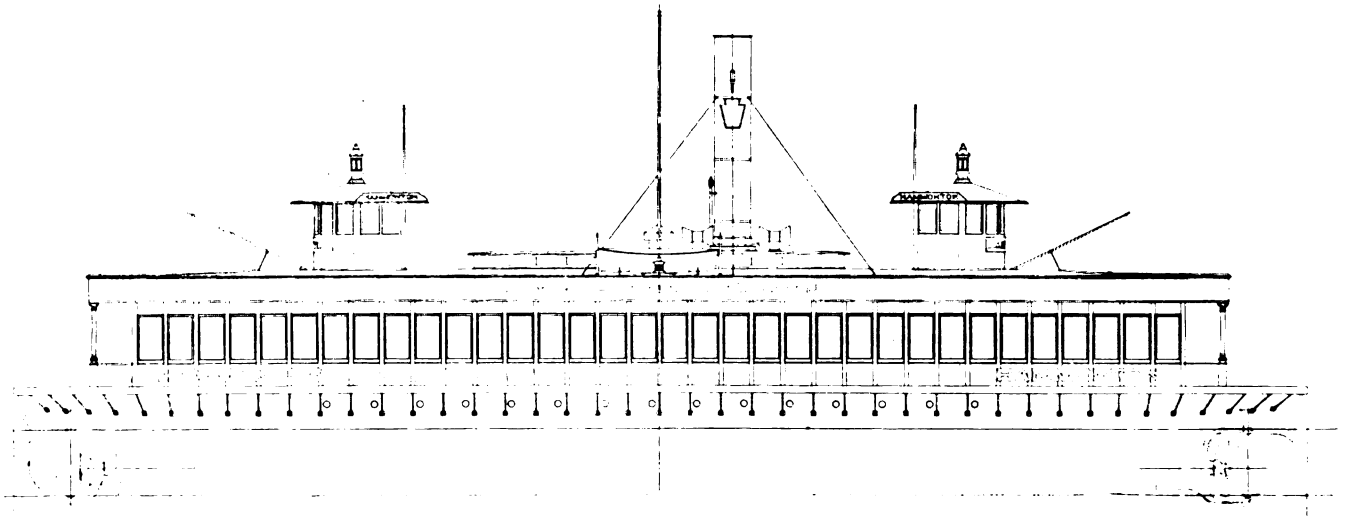
A FIREPROOF FERRYBOAT.

The study that has been given to the fireproof construction of permanent structures has developed build-

hundred lives, impressed upon those engaged in the transportation of passengers by water the necessity of following the progress that has been made in the construction of fireproof buildings, and vehicles for transportation, on land. By some of the transportation companies this feature was appreciated and an attempt to carry it out has in a measure been followed for the past fifteen years; on the ferries of the Pennsylvania Railroad Co. no ferryboats have been built during this period on which inflammable material was placed close enough to the sources of fire to be in danger of ignition.

As the subject of our paper is ferryboats, we will confine our discussion to this type of vessel. Fires on ferry-

Recently another and more serious source of danger arises in the transportation of automobiles. Fire occurring on one of these on a ferryboat would be very disastrous, as on most of the ferryboats they occupy a space surrounded by the lightest and most inflammable materials that are difficult of access. After they were permitted to use ferryboats a rule was established that they should be stowed at either end of the boat, so that they could be wheeled overboard in case of accident. That this rule was good is proved by the fact that it has been necessary to carry out the idea. The increase in the number of automobiles to be transported, however, makes it impossible to carry all of them on the ends of the boats, and ferryboats de-



FERRYBOAT HAMMONTON.

ings that may be truly considered fireproof, and this result has been brought about by the invention and combination of materials of fire-resisting qualities.

It seems to be the tendency each succeeding year for a greater number of people to congregate within a smaller area, not only in their homes and their business places, but on the vehicles they use for transportation. Accidents to vehicles for transportation have resulted in a considerable loss of life by fire from the fact that these vehicles have been constructed of inflammable material, and transportation companies realize the necessity of building their passenger cars of materials that will not burn. The progress in this direction has been very rapid and so successful that it is extremely doubtful if wooden passenger cars will again be constructed for use on one of the largest railroad systems of this country.

The calamity of two summers ago which resulted in the loss of over six

boats have been frequent, but the consequences usually slight, because of the vigilance exercised by the employees and the means installed for the extinguishment of fire. The principal cause of fire has been the stowage of hot ashes in improperly constructed ash bins or improperly constructed ash pans beneath the boilers. Following in order may be classed imperfect electric wire construction; the accidental overturning of petticoat lamps; the overheating of the smokestack; and finally—one of the most annoying of the many—the throwing of lighted matches beneath the seats by passengers after lighting a cigar. Attempts to eliminate these causes of fire have been made by permitting no woodwork or other inflammable material below the main deck; by running the electric wires in iron conduits with sealed junction boxes; by forbidding the use of petticoat lamps above the main deck; by protecting the stack with an iron enclosure, and by enclosing the space beneath the seats.

signed in the last two or three years have the walls and roof of the space they occupy made of metal.

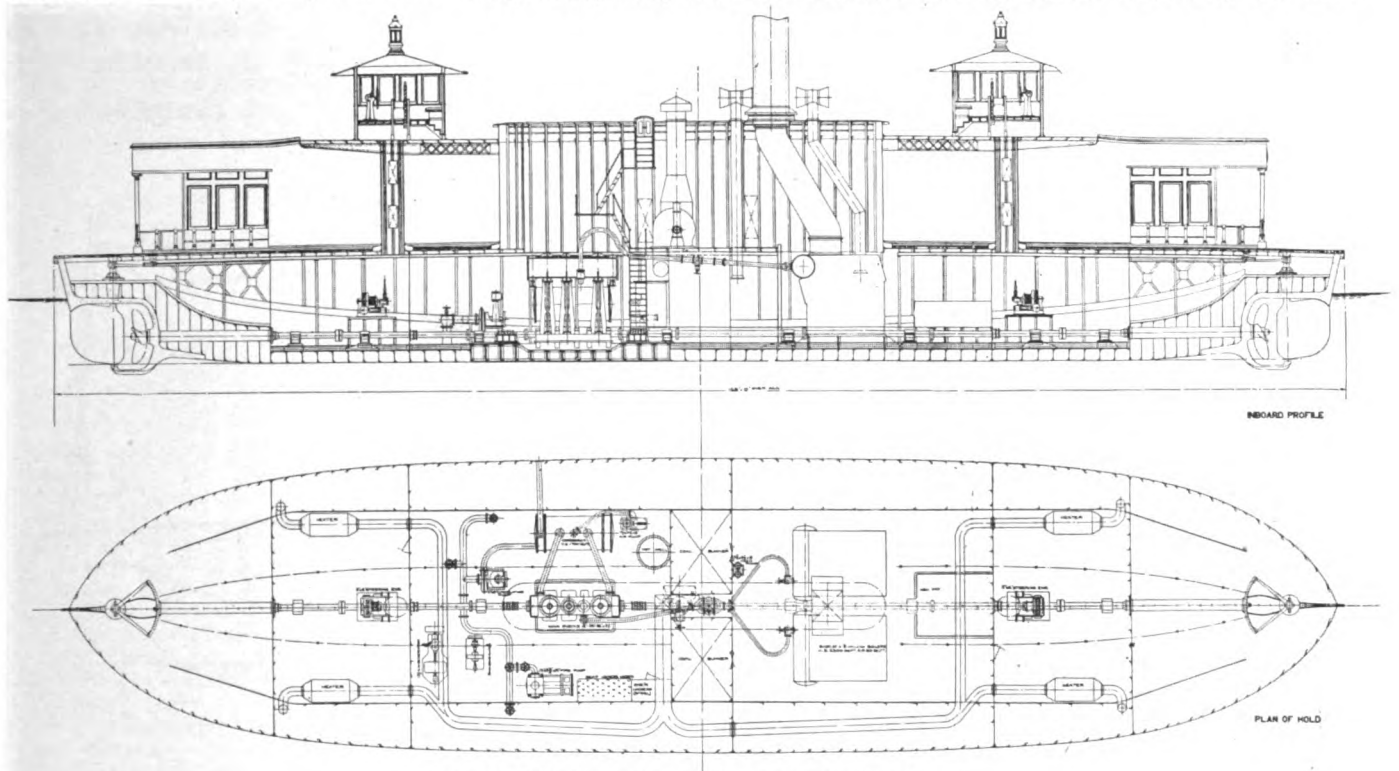
The above review would seem to indicate that fire risks have been taken care of, but new dangers are continually arising and it is clear that a ferryboat to be free from danger of destruction by fire should be built of non-inflammable material or what might be known as fireproof type, because inflammable materials can be used in such a way that there is no possibility of their doing damage. The amount of flame that a piece of wood will produce per unit of time depends first, upon the surface exposed, and second, whether the surface is laid vertically or horizontally. It is evident that a stick 12 in. square, while it contains the same volume, will not produce as much flame as twelve boards 12 in. wide, one inch thick, also that the flames on the surface laid horizontally will not extend as rapidly as if this surface is laid vertically. These features must be borne in mind in the

designing of fireproof structures, as up to the present time it seems to have been impossible to eliminate the use of wood.

It has been thought by many that the danger of loss of life on a ferryboat is very remote, principally because of the boat's short route, and the experience of the past supports this view. Nevertheless, all of us were appalled at the loss of life on the General Slocum. This boat had better opportunities for securing a landing place for her passengers than a

main deck steel plates and angles have taken the place of wooden stanchions, carlins and sheathing. Realizing that in this particular part of the boat, wood would give sufficient strength with very much less weight than steel it was necessary to closely study the strength of the various sections of plates and angles employed to build up the structure, and notwithstanding the fact that these sections were made as small as thought safe it was estimated that the steel structure will weigh nearly thirty tons more than the

These moldings are a recent production and are made by drawing thin strips of steel 5-100 in. thick through roller dies that form the plates into the shape of section desired and of any reasonable length. The angles, grooves and coves are drawn so sharply that when painted the moldings cannot be distinguished from the most perfect wooden molding, and the section is so uniform that joints may be accurately made. The panels thus produced are fastened to the angle iron stanchions supporting the walls



PROFILE AND HOLD OF FERRYBOAT HAMMONTON.

ferryboat has, yet a combination of circumstances which it is unnecessary here to discuss resulted in the most appalling disaster that has happened to any of our harbor craft, and while it may be claimed that such a combination will not happen again, the fact is indisputable that the disaster would not have occurred had the boat been of fireproof construction.

Extending further the ideas they have long had in mind and appreciating the advantages to be gained from a fireproof ferryboat, the Pennsylvania Railroad Co. prepared the designs of the boat illustrated in this paper and entered into an agreement with the New York Ship Building Co. at Camden for its construction.

The drawings will show that below the main deck the design departs but very slightly from the prevailing practice, and no woodwork is used in this part of the boat. Above the

wooden structure. This increase, however, is only about five per cent of the total displacement of the boat.

As a slight ornamentation of the cabins of a ferryboat has been looked upon as necessary, an attempt to carry out this feature has been made by employing some of the materials mentioned in the fore part of this paper as being developed by the demand for fireproof construction. The ceiling and side walls are almost entirely covered with a material known as asbestos building lumber, which is a composition of asbestos and Portland cement that is fireproof, is not affected by moisture, has a reasonable degree of tenacity and can be manufactured in large-sized panels with a smooth and even surface which receives paint quite as satisfactorily as wood. This material is formed into panels by fitting steel moldings of suitable design around its edges.

of the cabin by means of narrow plates $\frac{1}{8}$ in. thick.

It will be noticed from the sketches that the connection between this angle iron and plate is made with pieces of wood which are fastened to the angle bar with bolts, and to which the thin plate is fastened with ordinary round-headed wood screws. It will also be noticed that the panel frames are fastened to the thin plate which forms the ground of the wall in the same manner, the round heads of the screws being exposed to view. At these points it will be noticed that a limited amount of wood is used, but it is protected from any external flame by iron plates, and the amount used is thought to be insufficient to cause any considerable damage. For instance, a lighted match alongside of an iron plate would burn itself out without doing damage, whereas, a volume of kindling set afire would cause the plate

to bend out of shape; therefore, it is apparent that somewhere between these two extremes a certain amount of wood can be used in fireproof construction without dangerous results. It would have been possible to have made these fastenings with tap bolts, but the great additional expense was thought to be unnecessary.

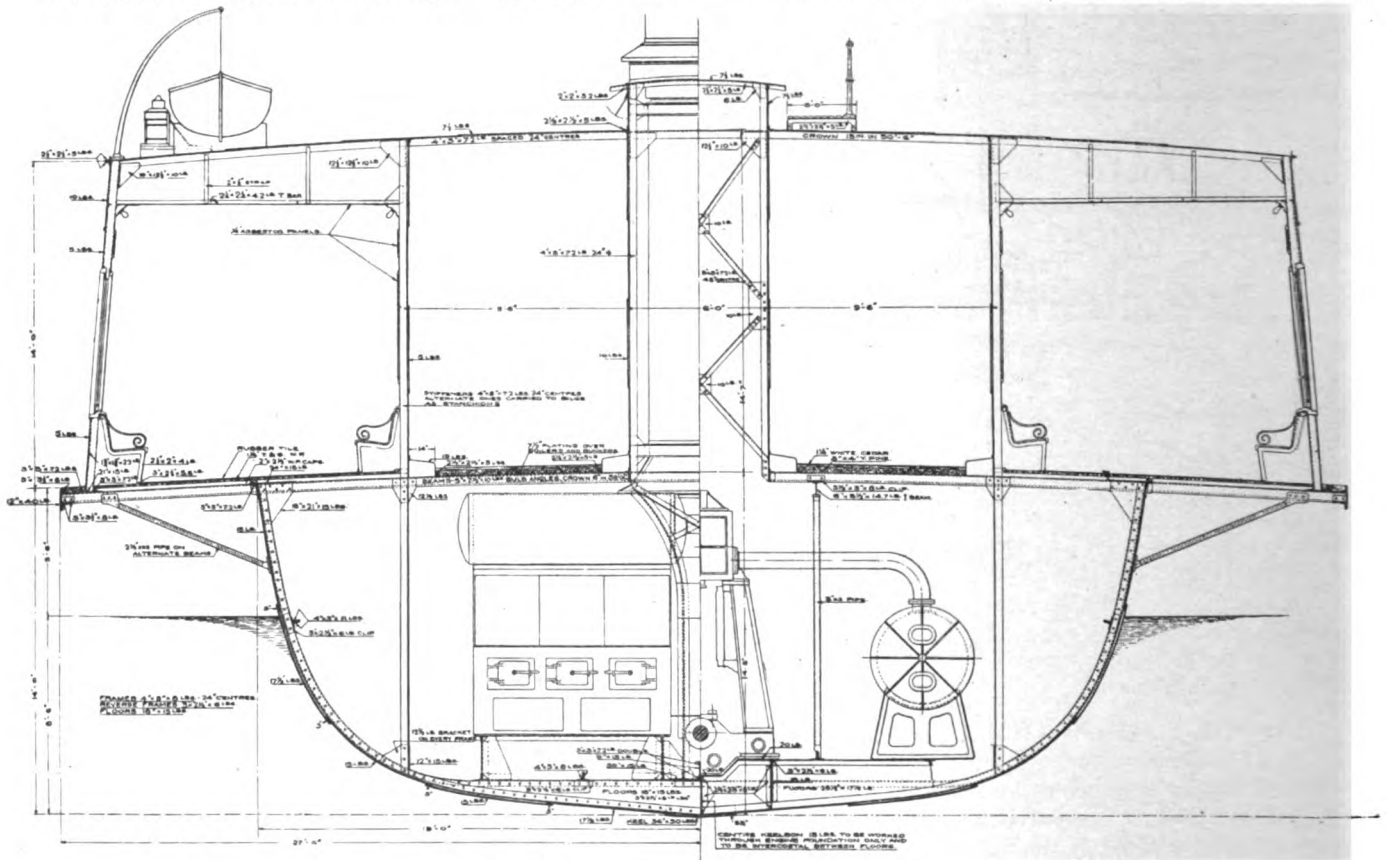
The seats in the cabin are made of drawn steel moldings supported on steel angle bars. The window sash, window sills and frames are made of wood, but the wood used is completely covered with sheet copper of No. 18 gauge, and recognized as thorough-

a fire-resisting material, but no such protection is afforded in the steam gangways. Without enormously increasing the weight of the vessel it was impossible to find a substitute for wood that would be entirely satisfactory for this particular place. However, the surfaces of this deck are horizontal, are very easy of access, are constantly in view, and it is therefore thought that a fire occurring on them could not extend very far.

It is estimated that the cost of this boat has been increased about seven per cent by the construction applied. The interest on this amount is only

erate steam, for it has been the policy of the Pennsylvania Railroad Co. to use only water-tube boilers on their ferryboats for the past ten years, as there is probably no one place where a boiler explosion would cause such a loss of life as on a ferryboat, which on its daily trips frequently carries over one thousand passengers.

This ferryboat will be named Hammonton, will be used on the ferry between Philadelphia and Camden, and will be completed the latter part of November; and in conclusion it is appropriate to state that considerable credit is due the New York Ship Build-



MIDSHIP SECTION FERRYBOAT HAMMONTON.

ly fireproof construction. The pieces of wood forming these parts are first molded in the section desired, then loosely wrapped with copper, and both together are drawn through dies that press the copper firmly down on the wood and lap-joint the edges of the copper sheet. It is this lap-jointing that is the important feature in the operation. Wood covered with metal cannot be considered fireproof if the edges of the material can be twisted away by heating, so as to allow the wooden surfaces to be exposed, and this particular defect has been the cause of destruction of many so-called fireproof buildings.

The main deck of the boat is made of wood. In the cabin it is covered with interlocking rubber tile, which is

about 25 per cent more than would pay for fire insurance premiums, and the balance is more than offset by what might be called the cost of fire vigilance.

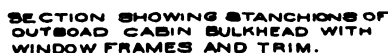
It is expected that the cost of maintenance of this iron structure will be considerably less than of a wooden one. The greatest enemy of steel is rust, but as the wooden joiner work on ferryboats is usually painted about once a year to keep up appearances, it is very evident that the steel structure will be amply protected from rust if painted this often.

Aside from fire protection, the boat is divided into watertight compartments to prevent her from sinking in the event of a collision, and water-tube boilers have been used to gen-

ing Co. for the enthusiasm with which they have entered into the details of construction, which appeared at the start to be very complicated and to which they have given a considerable amount of time and study.

DIMENSIONS OF FERRYBOAT HAMMONTON.

Length, over all.....	168' 0"
Length, outside to outside body post.....	167 0
Length, outside to outside propeller post.....	138 6
Beam, over guards.....	55 0
Beam, of hull molded....	38 0
Depth, from top of keel to top of deck beams, amidships	14 8
Camber fore and aft....	1 0
Draught	8 6
Displacement	625 tons.
Boilers—Two of Babcock & Wilcox type.	



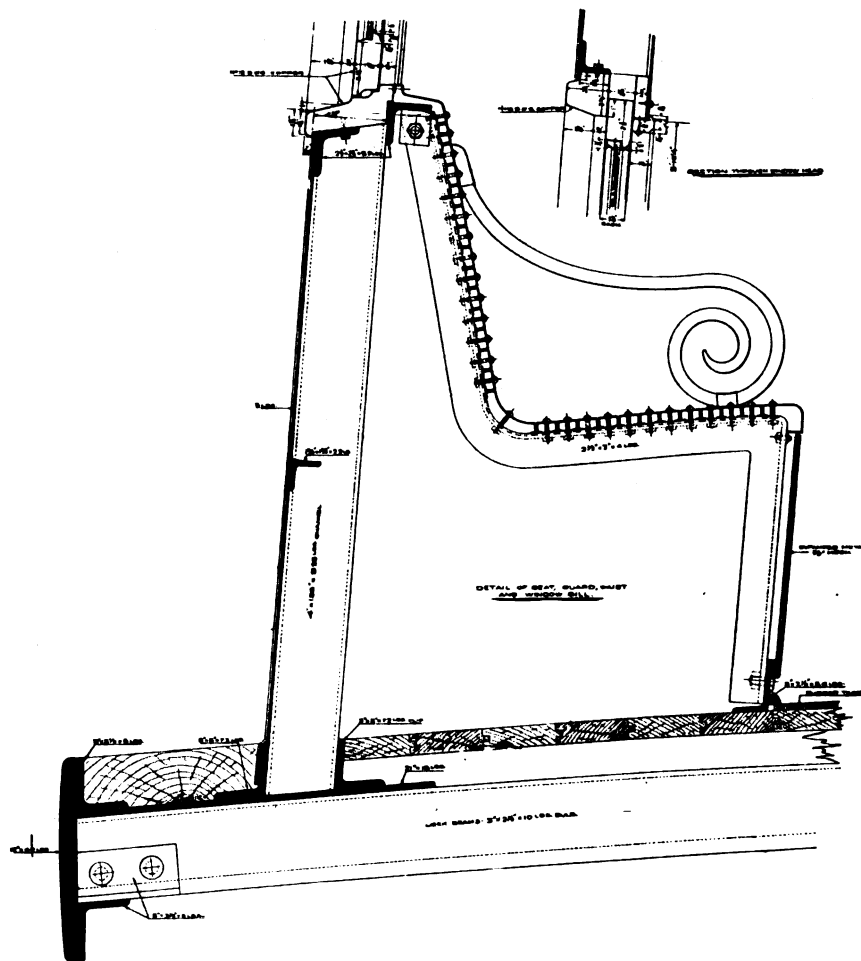
Grate surface, combined.	95 sq. ft.
Engine — Three cylinder compound:	
High-pressure cylinder	18"
Low-pressure cylinder	26
Stroke	22
Indicated horsepower.	600
Propeller, diameter 8' 3"; pitch,	12' 6"
Number of electric lights	225
Number of seats.....	272

DISCUSSION

The President — Gentlemen, these two papers are now open for discussion and we should like to have a very general discussion of this most interesting subject.

great horror on the part of the traveling public of being first burned and then drowned. They do not seem to

mind being mashed up in a railway accident and burned, but the transportation of human beings on the water is probably made more terrible to the timid by fear of fire than for any other cause. I would like to ask Mr. Du Bosque, in his paper, on page 5, in stating that the additional cost is seven per cent, whether he means that there is a seven per cent advance in the cost by reason of using this metal, over what the cost would be if he used wood, or does he mean that it is a seven per cent advance on the entire cost of the vessel? He says that this increased cost is offset by fire insurance protection and greater care being exercised to prevent fire. It seems to me it is also offset many times, if it is only seven per cent increased cost on the steel work over what it would be for woodwork, by the fact that if an accident occurs to the boat and the company is brought before a jury, they are in a position to show that every precaution has been taken to prevent fire and they would get off with much less cost. I would like to know where this steel which Mr. Du Bosque speaks of can be obtained. I do not want to make this society a



place for advertising at all, but I think it is of such importance that it would be perfectly correct to ask Mr.

Du Bosque where such steel can be obtained. I happen to have the good fortune to see some of this work, and it is most beautiful in its effect, magnificent in appearance, and there is only one thing, which is possibly in the nature of an objection, which presents itself to my mind regarding it. I notice that there are many sharp

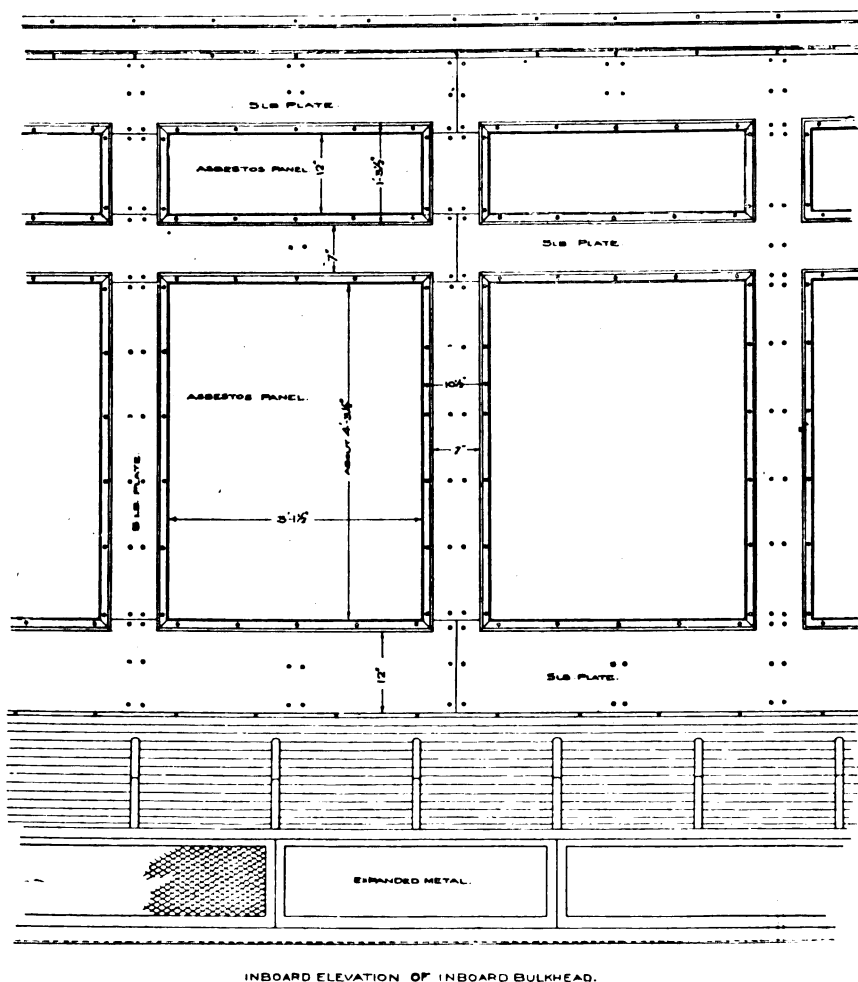
a composition of asbestos and Portland cement. I would desire to know two things in reference to that; first, the relative weight of that material as compared with the former materials used on ferryboats; and second, as to the number and efficiencies of experiments made showing that such materials is fireproof, if any, which have

sel which he describes has only one deck. I am sure if he had to put in a line of cabins he would find the matter very much more difficult.

On page 2 of his paper, Mr. Du Bosque states that some of the ferryboats designed in the last two or three years have the walls and roof of the space which automobiles and wagons occupy on the ferryboats made of metal. I do not know of any such boats, and would like to know which boats he refers to.

Mr. Du Bosque also states on page 5. "Aside from fire protection, the boat is divided into watertight compartments to prevent her from sinking in the event of a collision," etc. I should also like to know if Mr. Du Bosque has watertight doors in these watertight compartments, as adopted on almost every ferryboat, except the Staten Island ferryboats. It is well known unless some patent door is used for closing in the compartment, in the case of a collision, or in the event of the boat running against floating debris, and a hole is stove in the boiler space, that the ferryboat would sink; also the trim would be such that capsizing would follow.

Mr. F. D. King—Mr. Du Bosque begins his paper, it seems to me, quite properly by an allusion to fireproof buildings. Now, we know that only a few years ago the statement might have been made with a considerable degree of truth that the only fireproof structures in the world were the Washington monument and the Pyramids of Egypt. We all know that a tremendous change has taken place in fireproof construction within the last ten or fifteen years, so that now our large apartment houses and office buildings, etc., may be fairly said to be fireproof; but it should be borne in mind, in comparing marine construction with buildings, that that effect in buildings has been largely worked out by the employment of Portland cement, which, of course, is inadmissible on vessels or any floating structure. Now, while we cannot expect immediately to have fireproof vessels, the development which has taken place in buildings, it seems to me, justifies us in hoping that within a reasonable period the present conditions can be very much improved and it must be gratifying to all of us, I am sure, that these vessel owners have gone to such extraordinary pains to bring about that result. It seems to me that their labors have been justified to a great extent, have been assisted, in fact, by the fact that the vessels under consideration are not cargo steamers, not carrying freight



corners in the metal trimmings. Some years ago I had to make a lot of bent metal, thin steel, where there were sharp corners, and it lasted very well for six months, and then it began to crack. The parties needing it then began to have men brazing the corners. After thinking this over I came to the conclusion that the brazing, while it held the corners together, was not really what was wanted. What was necessary in that case was annealing, and after that we annealed the corners, and as a result we never had any further splitting of the corners. I would like Mr. Du Bosque to tell us where the material can be obtained.

Mr. J. W. Miller—Referring to the paper, page 3, Mr. Du Bosque says that the ceiling and side walls are almost entirely covered with material known as asbestos building lumber,

been made under the supervision of the Pennsylvania Railroad Co.

Prof. Alexander J. MacLean — It was my fortune, or misfortune, some two or three years ago, to work on the design of a ferryboat, and this particular matter of fireproofing was brought to our notice through an accident which happened some years ago. A design was drawn up so that the hull of this ferryboat should be fireproof—it was made by the Arc Metal Co., of New York City, that most of the naval officers know very well. Some of the warships have their fittings made by this company. The design was not thrown out because of the extraordinary expense. Mr. Du Bosque's design has certainly gone one step further, giving us, as far as possible, a complete fireproof vessel, but the matter has been made quite easy for him, inasmuch as the ves-

to any considerable extent, and they are therefore free from that sort of risk, for certainly the fires on marine vessels, as a rule, come from the combustible nature of the cargo.

There are several materials entering into these vessels which have been described which it seems to me should hardly find a place on a vessel purporting to be fireproof. One of these materials is linoleum, which seems to have been used in considerable quantities. I think there is hardly any material being put into the construction of buildings or vessels, which is so devilishly combustible as linoleum when a fire is fairly started. Of course, it is not likely to take fire from a lighted match being thrown on it, or a lighted cigar end, but when a fire is once started and gets headway, the linoleum will be an extraordinary promoter of the conflagration. In some of the vessels linoleum appears to be used in large quantities, and of very great thickness, a quarter of an inch or over. I have also grave suspicions about rubber tiling. While it is mixed with considerable earthen material which would retard the combustion of it, still its nature in the main is resinous, and when once started I think it would be likely to burn most rapidly.

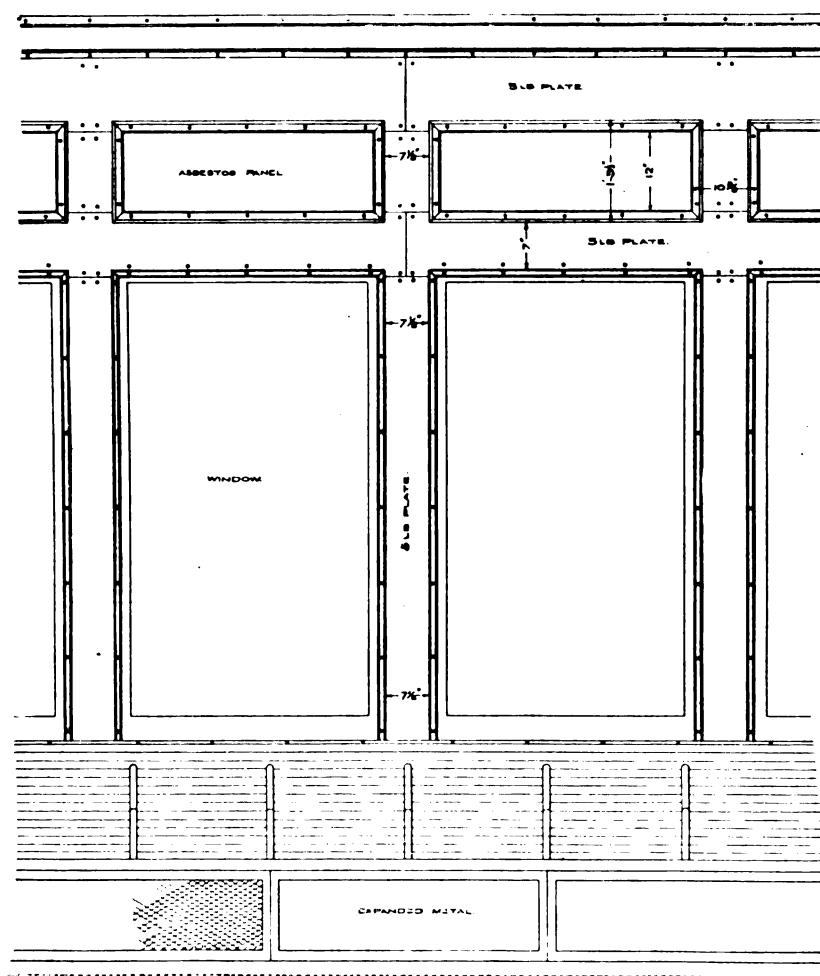
With regard to the moldings which Mr. Du Bosque speaks of, I think it would have been gratifying to all of us if he could have brought samples with him. We should have liked very much to have seen them. In my opinion one source of expense which would retard the use of these moldings is the fact that they must be mitred, of course, and the mitres are not all mitres of 45 degrees, so that the cutting up of the moldings and fitting them must be a troublesome matter and require special appliances. Mr. Du Bosque also spoke about another material which I should very much like to have seen samples of, and that is his moldings of wood covered with drawn copper. I think that is a material which would be applicable in a great many places to fireproof construction and would certainly be most interesting to see.

With regard to covering moldings in that way, it seems to me well worth while (we have electricians among us who can probably give us an opinion on the matter) to consider covering the sash for the windows of steamers and the moldings with copper by a galvanic-plastic process. If copper could be electrically deposited on these sash frames after they are put together, it seems to me we would have something still better than

moldings with drawn copper over them. There is another matter to which that process would apply, and that is to the seats. The seats of the ferryboat Mr. Du Bosque described struck me as uncomfortable. I think I would rather take my chances of being burned up once in a while than sit on those seats for any great length of time, though that is a matter where the proof of the pudding is in the eating of it. It may be that the seats would be found pleasanter than we anticipate. It does seem to me, however, that the galvanic-plastic process is applicable to such things, and I think it would be very valuable in its application to material like 3-ply wood, which has been used for seats hitherto and which in its ordinary condition is exceedingly combustible

edges of the glass were nicely browned and the sash fittings, lifts, etc., were nicely designed, so as to spread the effort of lifting over a considerable area so that it should not be concentrated and break the glass, and it seems to me that answered very well. A sash of that kind can be seen on the St. Gothard's railway from Italy to Switzerland. It may be true that the people over there are not so fond of working the sash and lifting the windows as we are in the United States; they are usually content to leave the window down.

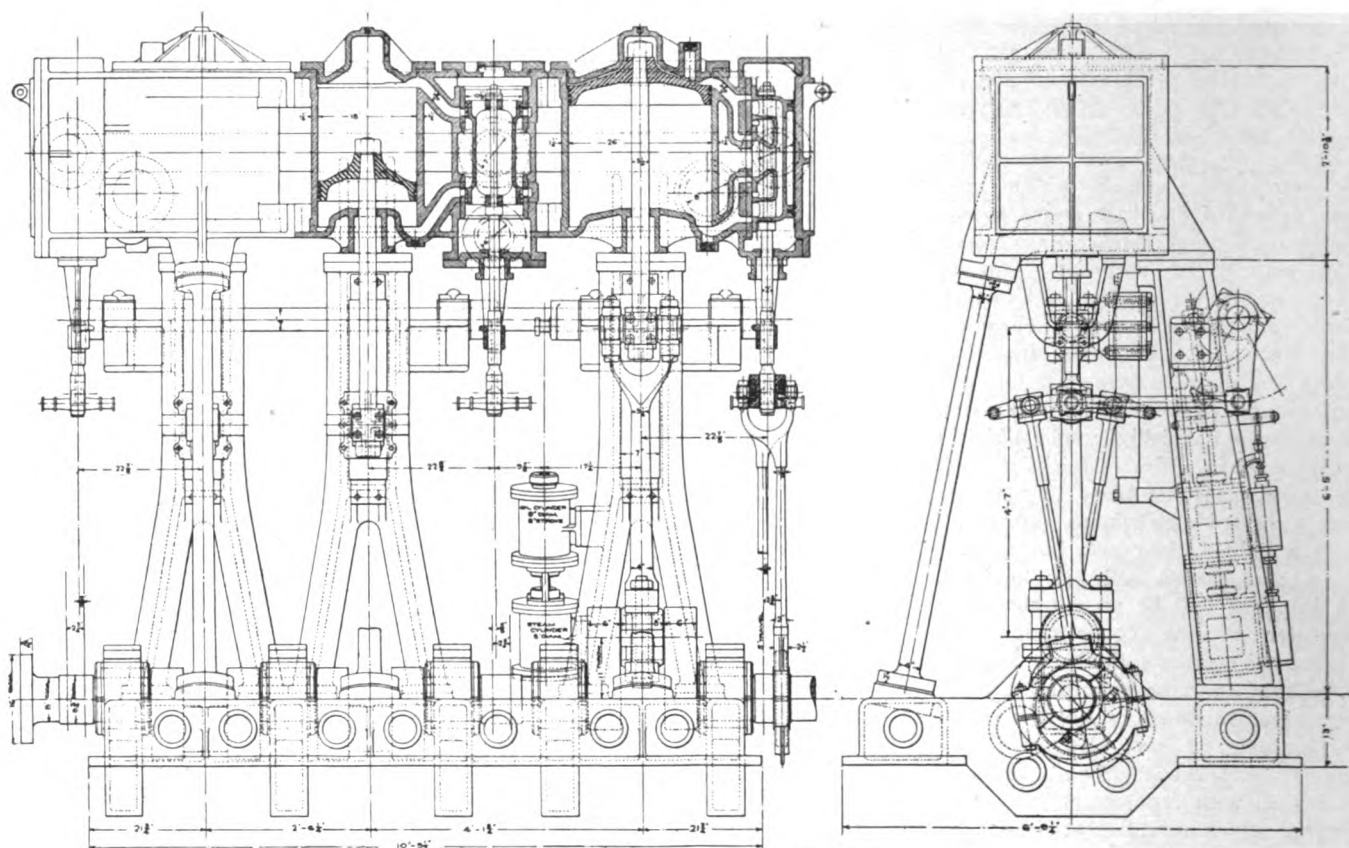
Mr. Gatewood, in his paper, referred to the use of corrugated iron partitions. It seems to me that is valuable in a great many places, where hitherto we have not thought of using it: It is really not a recent idea. I re-



INBOARD ELEVATION OF OUTBOARD BULKHEAD

on account of its thinness—it is like so much straw. Furthermore, with regard to sashes—probably the matter has fallen within the experience and observation of others—I have seen sashes on railway cars in Europe where the glass was plated glass, of rather extra thickness, but probably not more than one-quarter inch, where there was no sash at all. The

member of seeing partitions of such corrugated iron on the English troop ships, twenty or twenty-two years ago, and they were really finished very beautifully. They were not put in these ships particularly with the idea of fireproofing, but more with the idea of cleanliness and for the prevention of the accumulation of vermin, etc., on that peculiar service which



ENGINE OF FERRYBOAT HAMMONTON.

carried the troops from a very hot climate to very cold climates. These corrugated partitions were made of galvanized corrugated iron, and the surface of the iron covered with muslin or some other similar fabric, and laid on with paint and held closely together; and the corrugated iron partitions being covered with muslin and the muslin being painted, it had just such an effect as our corrugated iron paint has in preventing condensation. It seemed an idea worthy of wide application. A very important matter bearing on this question of fireproof construction is the use of thin steel for partitions in such way as to obtain the requisite stiffness. Mr. Gatewood especially alludes to that in his paper—the difficulty of using steel thin enough and maintaining its stiffness. The trouble with regard to that is that you have resorted too much to the ordinary stiffening, such as we would use in bulkheads, and the way out of it is partly to extend the use of this thin corrugated steel, and still another way out of it is by using two layers of corrugated steel. I have never seen this used for any such purpose, but I had occasion many years ago to design a partition of that sort, which was required to be exceedingly stiff, with extremely light weight.

Mr. F. Merriam Wheeler—The corrugations running parallel?

Mr. Miller—The corrugations cross

at right angles, and are riveted together at intervals, and you can see by properly spacing the rivets you can get in that way an extraordinary degree of stiffness with extreme lightness.

Prof. Maclean—Is there much noise?

Mr. Miller—No; the whole thing is riveted up tight. There is another feature of that corrugated construction, which I consider is worth considering, and I merely suggest it as an idea which might be worked up. That is, in the upper decks of light river steamers we have always resorted to wood, and have had an idea that nothing but wood would answer in that part of the steamer. It seems to me that we could use corrugated material of that description, but not have the corrugations of the ordinary wave shape, but of a square or rectangular section, and arranged to cross there in the same way. Such decks should be built in an altogether different way from any which have hitherto been designed. We heard a few years ago in the ordinary construction a great deal said about massed framing, meaning that the vessel should be built with keelsons of unusual strength and belt frames or web frames, crossing them, and the whole thing thoroughly tied together, the frame panel being much lighter than usual. In the construction of such an upper deck for a river steam-

er, it seems to me we ought to resort to massed framing of that sort with the space between the framing laid in with panels of some of this corrugated material. You are all familiar with the pasteboard fabric which is used so largely for packing all sorts of goods, and which is especially valuable for packing bottles. You know that it is made usually of two layers of pasteboard and a sort of corrugated fabric of pasteboard between the whole thing, being glued together. It seems to me it is possible to manufacture for the upper deck of a river steamer something of that sort to be made of panels of standard size and simply arranged to drop into this scheme of massed framing.

Mr. Stevenson Taylor—Personally I am greatly obliged to the gentlemen who have presented these papers. The subject is a vital one, one which doubtless most of us have had to give more or less consideration to. I do not know that I can add anything to the subject, but at the same time I do not mind giving you, if you please, the result of some cogitations.

The endeavor to make fireproof steamers is not new. When the Bristol burned in 1888, and a new Fall river line steamer because a necessity, that question at once arose, and the building of a steel upper structure was after consideration deemed impracticable. The contract was finally

made for fireproof paint, but before the completion of the steamer this was found to be of no great value. From time to time the original question has been discussed, considered and dropped, though when the car transfer Maryland was burned in 1889 a new Maryland was constructed almost entirely of steel. When the

at midnight when but two watchmen were awake.

The Plymouth was provided with the usual watchman's clock, there having been 18 stations throughout the boat, and it was the duty of the two watchmen alternately to go all over the boat and to prove by "punching the clock" at each station every half hour

mouth and again the question arose,—Cannot the steamer be made fireproof? and again the more complete designs and calculations were made with the conclusion by my associates and myself that fireproof steamers of the large river and Sound night traffic type are impracticable, if not impossible.

The known difficulties of building fireproof buildings on land are increased because a vessel must be of such form that it will float on a predetermined draught of water and the added weight of steel, or steel and concrete construction, which in itself is no objection on land, is a very different matter on a vessel.

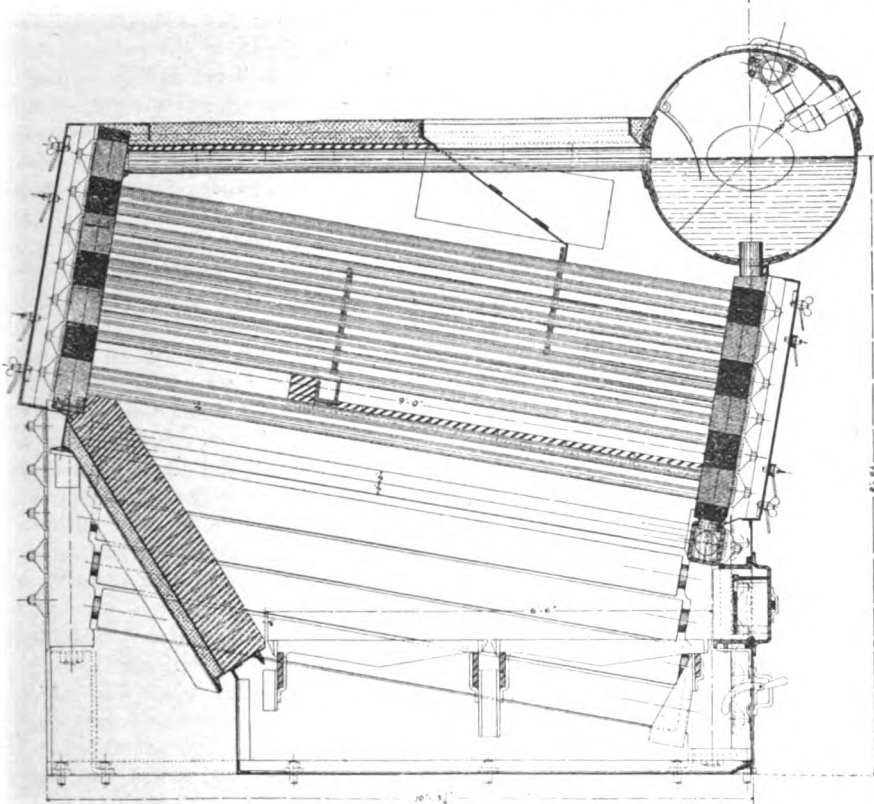
No building constructed of metal only, stands against fire from the contents of same or from fire outside. Under the heading "Fireproof Construction," the underwriters say—"In frequent fires such buildings (i. e., built of exposed steel or iron and usually termed fireproof) even when containing a limited amount of combustibles, have collapsed, illustrating the fatal weakness of this type, namely, weight bearing metal exposed to heat. We regard such buildings as less desirable than those of properly designed mill construction." The only possible fireproof building is one constructed of steel and concrete without any wood whatever either in or near it.

The next best construction is that recommended by the mill experts of the present day, viz., the slow-burning construction where wood is made of such breadth and thickness that the supports and floors will not collapse under a fire of short duration and where deterrents like water sprinklers and brick fire walls can be used to save the building from entire destruction.

Neither of these systems can be used in entirety on a steam vessel of the Fall river line class.

We designed a structure for this purpose entirely of steel; and taking the Plymouth for illustration we find that this will weigh at the very least four hundred and fifty tons more than the structure on the Plymouth, making 15 inches more draught of water. I may say indeed that the difference of weight here given is made with the belief that it will be far greater rather than any less.

I do not need to call your attention to the fact that the problems involved in vessels described in papers No. 1 and No. 2, though difficult, are simpler than those involved in designing a boat of the Fall river class, or any large night steamer. Mr. Du Bosque speaks of the small percentage of ad-



BOILERS OF THE FERRYBOAT HAMMONTON.

steamer General Slocum was burned with such disastrous results, the question again became very much alive and no doubt resulted in the construction of the steamers described in the papers Nos. 1 and 2.

By what some may term a strange fatality, indeed it may be easy to make many believe it to have been a warning, the steamer Plymouth, the construction of which was compelled by the destruction of the Bristol before referred to, was burned last March.

And here I wish particularly to call attention to the circumstances under which these fine large steamers were burned. I would emphasize the fact that neither was destroyed en route or with passengers aboard.

The Bristol had made the run from New York to Newport, and nearly every one had gone ashore, leaving the boat in charge of watchmen.

The Plymouth had been laid up for the usual yearly overhauling, which at this time included some very extensive repairs, and the fire took place

that they faithfully attended to their duties.

Though foreign to the subject it is proper to say that in my opinion watchmen's clocks are a delusion and a snare. There is not the slightest doubt that the watchmen on the Plymouth did faithfully perform the one duty of punching the clocks, thereby proving that they had gone over the route of the eighteen stations attached to the clock, it is equally certain in so doing they had omitted to do the greater and more important duty of really looking over the boat, for results clearly show that each of the watchmen must have passed the room where the fire originated at least once while the fire was burning. In other words, watchmen's clocks or detectors produce the habit of going over a defined route perfunctorily, the effect being that the watchman has only in mind the one thing, namely, punching the clock and thus missing the very duty which he is expected to perform.

It was decided to rebuild the Ply-

ditional weight. If you look at the profile of the steamer, you will see the sides are made entirely of glass, which would be similar in any construction of a steamer having only one deck. Even in the Jamestown the construction is simpler than would be involved in a vessel requiring 300 staterooms, all above the main deck.

The same objection of great additional weight lies also with the slow-burning construction.

To make a boat of the Plymouth class of such form that it can carry the additional weight on the limited draught of water necessary will be to make such a full model that the power required to drive it at necessary speed cannot be reasonably applied.

The steel construction must be sufficiently heavy to stand the various twisting strains caused by the waves of the sea and also to give proper rigidity. The simplest illustration of the differences between the present wood construction and making the same in steel is that of the upper decks. We now use 7½-inch thick white pine decking, which weighs but 2¼ lbs. per square foot. A steel plate of this same weight would be only a scant 1-16 in. thick, entirely unfit for use for this purpose.

Battleships are now constructed with quarters of all metal, excepting the doors to rooms and certain new pieces of furniture, all of which in case of action can be thrown overboard. Builders find the construction very much heavier than the wood structure formerly used.

To use the expressive phrase of one naval officer whom I consulted in this matter, these vessels are as hot as Hell's Kitchen. This experience confirms our own on the steamer Maryland, where passengers on summer days will not go inside of the cabins and where the engineer tells us that his part of the boat is hot in summer and cold in winter.

Again, the all-metal structure must be noisy in case of vibration caused either by the engines or by the sea.

Steamships built with steel houses have proven themselves death-traps through fire, the most notable instance being the fire at Hoboken, where a far greater destruction took place than at the Plymouth fire and where there was a great loss of life besides.

In our opinion there only remains for us to try to retard the fire by such means as are possible. We propose to make the quarters forward on main deck all of iron or steel; to cover all woodwork within the freight space with galvanized iron; to build two athwartship bulkheads of steel extend-

ing from the main deck to top of dome houses; covering of woodwork with sheet metal is also deemed unsatisfactory, though offering a good protection in case of a quick flash; to fit a sprinkler system as complete as practicable and to fit steam pipes to lower holds; in speaking of a device like the automatic sprinkler, it is difficult to avoid superlatives.

These will be additional preventives to a destructive fire, but the fact remains that after all dependence must be placed on the discipline of officers and crew, and I am very glad to say that this discipline would have in my opinion, prevented the disastrous Plymouth fire had she been in active service.

We have arranged to put in the reconstructed Plymouth, fire sprinkler service, following the putting in of automatic sprinkler service in the steamer Pequannock, which we built within the last year. In every stateroom there will be a sprinkler. Mr. King's suggestion that he might take the chance of being burned up rather than sit on Mr. Du Bosque's seat, makes me think that some women would rather take the chance of being burned up than take a shower bath in a stateroom, when they were not expecting it. I can only add that what we have done is purely experimental. I still feel that it comes back, as expressed in one of the papers, to the vigilance of those on board; do all we can, it comes right back to that, and I say, as I have said several times since the Plymouth burned, if I felt it possible for one of these steamers to burn up completely while en route, as the Plymouth was burned at her dock, I would never have anything to do with the building of steamers again.

Mr. G. W. Dickie—I fully agree with the remarks which have just been made by the last speaker in regard to this matter of marine construction. Apart from the possibility of making a fireproof structure, I think there will be great difficulty in preventing rapid deterioration of that kind of structure through corrosion at the back of the material. I know that some attempts I have made in that direction have turned out in that way. I was very greatly surprised at the neatness of the work that has been done on the ferryboat which is the subject of Mr. Du Bosque's paper. The work was not only neatly done, but I think quite cheaply done. I watched it with considerable interest, and I know that there is no doubt about being able to make that work satisfactory in appearance. How long it will remain so will have to be a mat-

ter of experience. There is very little to keep the joints together, and that is one difficulty about all mitred metal work, unless they are actually riveted together. However, I think these two examples which we had brought before us this morning will be worth watching, and if they last, there is no doubt but what they will be repeated.

One thing I noticed that Mr. Gatewood mentions as an important feature in his boat is that she is fitted with Scotch boilers, and the other of the papers mentions it as a peculiar feature and one leading to safety, that the boat was not fitted with Scotch boilers, not because the Scotch boiler is more apt to get on fire than any other (for I think it is the other way), but because the Scotch boilers sometimes burst. The only explosion of marine Scotch boilers I know about are those which have been exploded in this room, and nowhere else that I have ever heard of; but locomotive boilers explode quite frequently, and I notice though the Pennsylvania railroad has put in water-tube boilers on ferryboats, for the purpose of avoiding explosions, they have not got to that practice in connection with the locomotive,—Mr.

Mr. Du Bosque—Our locomotive boilers never explode.

Mr. Dickie—Oh, yes, they do. I saw in the paper this morning that a locomotive which was standing at the depot exploded and killed two people—I do not recall whether it was on the Pennsylvania railroad or not. I think the water-tube boiler is a boiler more apt to cause fire on a boat than the other; the fire being outside of the water-tube boiler, and depending entirely on the casing to confine it to its proper location, and that sometimes fails. I believe, however, that this method of construction is important and is worthy of consideration and earnest study by all those engaged in this class of work. I believe that there is a place for it and that it will find its proper place. I do not think that the upper works of steamships that have to go in rough water can be made of that construction; I do not believe that is possible. I do not believe it is possible to so shape light material that it will give the requisite stiffness and enable it to be used in that way. For the purposes related here this morning I think it can be used. Probably there was more difficulty in the boat Mr. Gatewood described than in the other; I am quite sure there was, and I think they will find that the passengers in walking over these very light decks made of very light plate will not quite

like the springiness underfoot. It is like walking on a cushion to walk on some of these decks, even where they are one-quarter inch thick.

Mr. W. P. Roberts—It is up to me to remark that I have seen a water-tube boiler burning 70 lbs. of coal per square foot of grate in operation for more than one hour with the paint in contact on the outside of the casing.

Mr. F. Merriam Wheeler—In the first part of Mr. Du Bosque's paper he gives a list of the principal causes of fire on ferryboats, and later on, referring to the main deck of the boat, which is of wood, he says: "However, the surfaces of this deck are horizontal, are very easy of access, are constantly in view, and it is therefore thought that a fire occurring on them could not extend very far." It reminds me of the time when I witnessed a very serious fire on one of the New Jersey Central railroad boats a few years ago. I was on a sister boat and about to leave the slip going over to New York, and this other boat—I forget the name of the boat—and it only seemed a second when the entire deck of the boat was a mass of flames. I never saw anything like it in my life; and I would like to ask Mr. Du Bosque, or some of the other members present, if they ever discovered the cause of the fire. The daily papers suggested that some evilly disposed person had sprinkled the deck with some inflammable material, liquid or otherwise, which caused a very sudden fire. In spite of all the vigilance which was exercised on the boat, the fire occurred, and it occurred while the boat was in the dock. Will Mr. Dickie tell us, when he speaks of Scotch boilers, how about the ferryboat Westfield—she was fitted with Scotch boilers.

Mr. Dickie—The Scotch boilers were not known then.

Mr. Stevenson Taylor—For Mr. Wheeler's information, I will say that the boiler on the ferryboat Westfield, which exploded one afternoon in August, 1870, was a drop return flue boiler, ten feet in diameter, and equipped with a shell 5-16 in. thick.

Mr. Du Bosque—For Mr. Taylor's information, I would advise that about four years ago a boiler, very much resembling a Scotch boiler in its characteristics, exploded and killed 60 persons who were on a boat on the Delaware river.

Mr. R. C. Monteagle—Mr. President, with reference to the fourth cause of fire on ferry boats enumerated by Mr. Du Bosque in paper No. 1, viz., the throwing of lighted matches beneath the seats by passengers after lighting a cigar, I

would suggest a simple and effective method of prevention of such fires, and that is, that smoking on ferryboats be prohibited. Entirely ignoring the very real danger from fire arising from the careless and irresponsible handling of matches, it appears to me that from a hygienic point of view the order would also be beneficial. The atmosphere in the cabins of the New York ferryboats assigned to men is so vitiated, and the saliva of some of the smokers is so profusely distributed in all directions that these, singly and conjointly, are a direct menace to public health, and hence should be corrected. It would appear that a man who cannot refrain from smoking for a period of time long enough to make a single trip on a ferryboat around New York city is not in a healthy condition, either physically or mentally. On the grounds of danger of fire as well as public health, this matter might be given attention.

Mr. Du Bosque—I would like to ask what ferryboats you refer to?

Mr. Monteagle—Those going to Brooklyn, particularly Hamilton ferry.

Mr. Du Bosque—From Jersey City to Brooklyn?

Mr. Monteagle—No, from New York.

Mr. Du Bosque—You are speaking of ferryboats on the East river.

Mr. Monteagle—Yes, but I think it would apply to all ferryboats.

Mr. Du Bosque—Have you had experience in riding on North river ferryboats?

Mr. Monteagle—Yes.

Mr. Du Bosque—Do you find that condition prevails?

Mr. Monteagle—Yes; more or less.

Mr. Du Bosque—The statement is often made that the cabins of the ferryboats are very filthy and foul; there are some that are, but there are some that are not. The most prominent ferryboats in this harbor on the North river are not foul. I think the majority of the members will agree with me in that statement, because they are provided with ventilation for forcing air into the cabins, not only for heating, but for ventilation; but I will qualify that by saying that if a man goes across a ferry at 6 o'clock in the evening, or 5 o'clock in the evening, he may find the cabins in a rather soiled condition, because at that time there have been 5,000 people passing through the cabin inside of an hour, and no public conveyance can adequately provide for such conditions. Whenever a man says the cabins of the ferryboat are foul, the statement should be qualified by saying what particular boat or what particular route is referred to.

Mr. Carl C. Thomas—There is a point not directly related to fireproof construction which I desire to refer to. I have in mind the remark of a somewhat noted

fire insurance inspector to the effect that if the location of fire-fighting appliances, notably pails of water and sand, were properly studied out, and so located that they were not directly in the place most likely to catch fire, as I remember, 95 per cent of the incipient fires would be extinguished before they did damage. In that connection I have in mind a fire which I witnessed, where one of the first things burned was the fire hose, which was intended for fighting fire in that compartment.

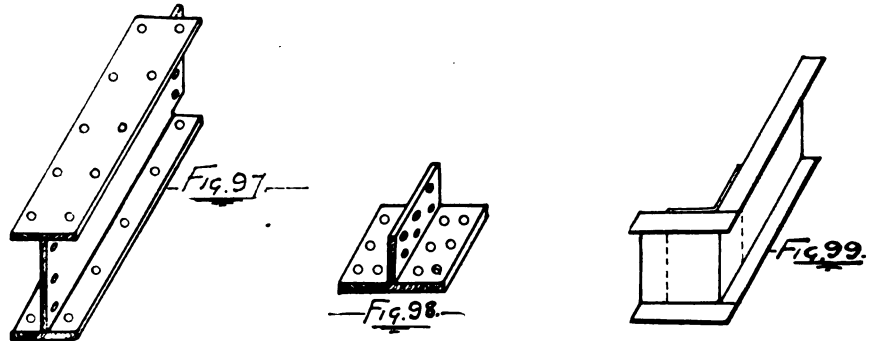
Capt. Miller—Before this discussion closes, I wish, as the man who is handling close on to three-quarters of a million of passengers on Long Island Sound annually, to express my extreme thanks to these two gentlemen for the knowledge I have gained from their papers. As Mr. Taylor remarked a few moments ago, when I reached Newport after the burning of the Plymouth and saw the destruction which occurred in a few minutes, I felt then and felt afterwards that if such an accident, such an important result, could follow from a small flame on board of a steamer of that character, if such conflagrations could occur and there was no means of preventing them, I wanted to leave the steamship business alone. I mention this fact more particularly, because I have been working for the last six months with Mr. Taylor and others to see if there is not some way in which we can make a totally fireproof Sound boat, but up to the present time I regret to state that desideratum has not been reached. When I say that, I mean that our present knowledge of these things, our inventions and facilities, have not approached the stage where we can do that. You must remember that our problem is this:—we have a one-night floating hotel, to take the people from New York to Boston and vice versa, who would otherwise go to hotels in those cities; that every one of these people wants a Waldorf-Astoria room, or something equal to a first-class hotel, and that the problem is not what it is on a sea-going ship making voyages across the Atlantic. Our passengers will not go into the holds of the ship. Therefore, in order to have passengers at all, we have to place them up in the open air; therefore there is no use of building a Sound boat at all unless you can so place them in the open air up above the structural part of the hold. That is one problem. The second problem is that these boats run in the summer time. If we were allowed by our maximum draught of 15 ft. to build steel structures for the upper works, they would be so hot we would not get the passengers to ride on the boats. The third reason Mr. Taylor has touched on, and that is this—that if we attempted to use steel or corru-

gated iron, we would get to such weights that we would get beyond our maximum draught allowed. Therefore I do not see, and I regret to state it, our way clear to adopting that form of construction; but I would like further information on the subject; that is what I am looking for from some of you gentlemen some time. I feel that the way in which we can further the retardation of fire on board ship is by some such method as has been outlined here today; that the methods suggested give us some hope of being able to provide against catastrophes by fire involving 1,000 people, that being about the number which are carried upon our boats each night. The responsibility is tremendous. I will mention that all the fires of the past go to prove, it seems to me, this fact—that if any steamer of large passenger capacity on our inland waters, or on our Sound could keep back a fire for half an hour, the passengers could be got off the steamer in safety; our property would go, but our people would be saved. That applies not only to retarding of the burning of the steamer, but we might acknowledge among ourselves

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Fig. 98 shows the mold for corner angles, the T-shape serving the purpose of marking a right and left angle. The



flange of the clip looking to the center of the ship is long on top and short at the bottom to suit the camber of the beam.

Fig. 96 shows the spar-deck stringer beams with a template in place for copying the stringer plate as practiced in Scotland.

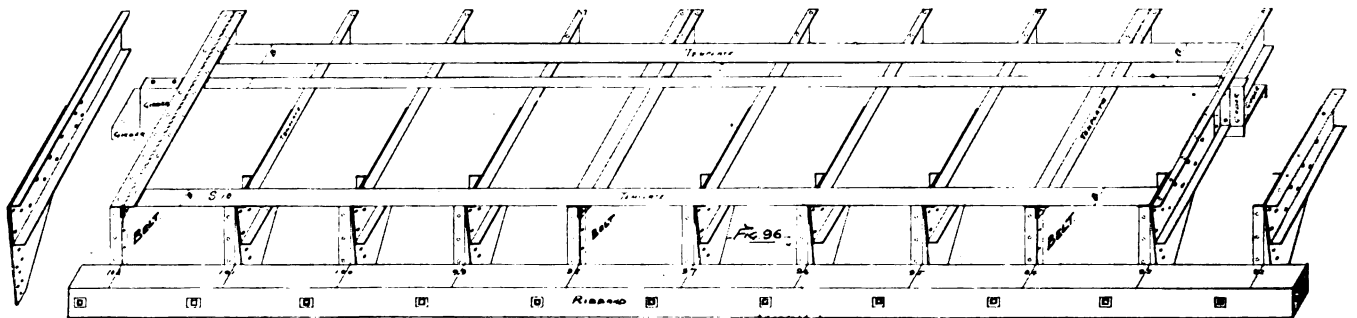
In Scotland the work would not go on as explained on the lake system, as there is a certain method which is very

top fastening the beams to same which are left there until the beams are riveted to the frames and all the deck girders in place and riveted.

Fig. 96 shows a vessel ready for the stringer plate to be put up and the method of copying same. This template

is made of pine 6 x 3-16 inch and in length equal to the length of the plate. In this case the template fits to exact place of the plate only the ends are long. The butt marks are put on as shown by dotted lines B. This determines the place of the plate on the ship, care having been taken that room for the butt strap is secured between the beams.

The rivet holes in the beams are



here that the only way of saving people on steamers which are on fire is to give them a chance to get off, by means of the aid of another steamer or making relays of boats or rafts. There are very few steamers which could take all the passengers and the full complement of officers and men from off one of the Sound steamers, and it would be therefore necessary for any steamer which was rescuing people from these boats to have assistance or to make trips in relays.

I hope I have not taken up too much of your time, Mr. President and gentlemen, but the responsibilities on the heads of the managers of these large steamboat lines carrying passengers and freight is very great, and any light which can be thrown on the subject of a fireproof boat, which may come in the form of some new structure or material, is to be hoped for in the future, but at the present time I do not see where it is.

The balance of this interesting discussion, including Mr. Du Bosque's reply will be published next week.

seldom deviated from. The beam is taken from the stock pile and bent to the shape of beam mold.

The camber of the beam is obtained in a similar way to the lake method, but instead of making molds as done on the lakes, the bevels are given on a board and the lengths on a batten.

Molds are made for the deck plating rivet holes as well as the beam brackets, but the lap holes for the plating are never punched, being drilled after the inside strakes of plating are in place. The laying out of the beam is practically the same in Scotland only instead of making a half mold for the beam, strips are used for the bracket holes.

The beam brackets are fitted on the vessel when the beam is faired and the holes drilled in same. On this beam there are three rivets connecting the beam to the frame and in Scotland only one of these holes would be punched, the others being drilled when the beams are faired up.

After the frames are erected the beams are put up and ribbands run on

marked on the template with whitening and when the template is laid on the plate, the marks are down, the template being on the plate as shown on Fig. 96.

Under the whitening the plate is dampened and by slightly striking the template with the hand the impression of the rivet holes is left upon the plate.

By this method of marking the plate it allows all the holes to be marked and punched on one side and saves turning the plate over to have the holes with the smooth side next the beam. The beam holes are punched small and counter-sunk through, which removes the rag left by punching on the under side of the plate. Sometimes if the marker does not have enough of work ahead, he will put up two templates on the ship and on one end of each will have a piece of template nailed on representing the butt of the next plate. In this way he will lift all the plates on the strake and make very good and quick work.

The process of making the inner stringer is similar to the outer, only the

outer plates must be in place before the inside plates can be proceeded with.

After the outer stringer plates are on, a batten is put on and faired in to make sure that the ship's side is true and pleasing to the eye. A line is nicked in on the stringer plate for the marker to put his template to. The sheer strake butts and any fittings which may come on the angle are painted on the plates or nicked in with a chisel, thus saving the drilling for same and at the same time getting the rivet holes in the right place. All the straps and strips are marked from the ship and any case where there are three thicknesses the holes in the middle plates are punched a size less and rimed out to the right diameter of the rivet. The deck plates from stringer to stringer would also be lifted from the ship by means of a batten wide enough to take the holes in the belt frame angles and a strip nailed at right angles to same for the seam holes.

The belt frames at deck would be straightened up with shores from the tank top so that the beam angles would be perfectly straight before the marker proceeded with the work. The hatch coamings would be lifted from the ship in a similar way to the other work. It will be noticed that quite a lot of staging is necessary for the men to get around on by this method of construction, to even mark the different pieces. The fitting up of the deck work as per plan, Fig. 87, would cost in Scotland \$2.50 per foot, while on the lakes this work can be done for one-third less.

PASSENGER STEAMBOAT LINES.

The annual meeting of the Association of Passenger Steamboat Lines was held in New York last week. From a small beginning a few years ago, this association has now grown to include nearly all of the prominent passenger steamboat lines in the United States. Its meetings, while not ordinarily of much interest to the public, are of great importance to the steamship lines, as views are exchanged concerning the issuance of tickets, the establishment of special rates for special occasions, the operation of the ship with reference to types and the general conduct of the steamship business. The meeting did not upon this occasion touch upon any of the existing laws or upon their amendments in any particular. Thirty-five members attended the meeting. Officers were elected as follows, being practically re-elections: President, Geo. A. White of New York; secretary and treasurer, W. F. Herman of Cleveland; executive committee: T. F. Newman, Cleveland; J. C. Evans, Buffalo; B. W. Parker, Detroit; F. C. Reynolds, Mil-

waukee; H. W. Thorpe, Chicago; C. M. Englis, New York and C. J. Smith, Montreal. On Saturday evening a banquet was held at Delmonico's and speeches were made by Harvey D. Goulder of Cleveland, Congressman Olcott and Mr. Andrew Fletcher of New York. Mr. Fletcher's remarks were especially interesting, as he discussed the new turbine steamer Governor Cobb, which his company has lately equipped with Parsons turbines for the Eastern Steamship Co. He spoke with enthusiasm of this mode of propulsion and described the Governor Cobb as a great success in every way.

Those present were: Congressman Olcott, Congressman Bennett, Congressman Waldo, Congressman Wilding, Andrew Fletcher, W. I. Babcock, O. H. Taylor, passenger traffic manager Morse lines; E. H. Snyder, president Catskill Evening line; H. R. Odell, assistant to president Central Hudson Steamboat Co.; T. F. Newman, general manager C. & B. Trans. Co.; W. F. Herman, secretary and treasurer C. & B. line; W. C. Hope, general passenger agent Central R. R. of New Jersey; C. M. Englis, president Citizens Steamboat Co.; D. A. Loomis, general manager Champlain Transportation Co.; A. A. Schantz, general superintendent D. & C. line and D. & B. Steamboat Co.; W. Campbell, superintendent Detroit, Belle Isle & Windsor Ferry Co.; J. C. Evans, western manager Erie & Western Transportation Co.; A. W. Goodrich, president Goodrich Transportation Co.; H. W. Thorp, general manager Goodrich Transportation Co.; E. E. Olcott, president Hudson River Day line; F. B. Hibbard, general passenger agent Hudson River Day line; W. Y. Hawley, secretary Hudson River Day line; G. A. White, assistant general manager Hudson River Day line; F. C. Reynolds, Manitou Steamship Co.; F. C. Cruger, manager Northern Steamship Co.; B. W. Folger, manager Niagara Navigation Co.; C. G. Whiton, agent and treasurer New Bedford, Martha's Vineyard & Nantucket Steamboat Co.; C. J. Smith, general manager Richelieu & Ontario Navigation Co.; B. W. Parker, general manager White Star line; F. E. King, secretary Dominion Marine Association; D. Van Cleaf, president Delaware River Navigation Co.; Harvey D. Goulder; Frank E. Kirby.

The city of Lorain has decided to keep the river open this winter and will keep in commission for ice crushing purposes a tug, equipped with fire apparatus.

CANADIAN GRAIN TRADE.

Editor MARINE REVIEW:—A month ago Canadian vessel owners looked for a most active fall season. Rates promised well, and many good paying charters were refused in the hope of higher ones being obtained later, and the unusual course of lowering the minimum schedule of rates at this season of the year had to be taken by the Dominion Marine Association, to meet the conditions obtaining in the wheat carrying trade.

The blockade at Georgian Bay ports has been another fruitful inconvenience and loss of money to Canadian vessel owners, and it looks as if the government, or some authority, would have to step in and remedy the situation at these ports by compelling the railways to furnish sufficient cars to at least take care of our own crop. It is not a very gratifying spectacle to see such large quantities of grain consigned to American ports, and taken to the seaboard through American territory, in the face of the immense sums of money the Canadian government has spent in subsidizing railways, and improving her waterways, and there does not seem to be any good reason why the Canadian railways and Canadian waterways could not take care of practically every bushel of our grain.

The recent severe snowstorm which occurred on the night of the 16th and 17th swept the western end of Lake Superior. The gale came from the southeast, accompanied by a blinding snowstorm. The steamer Theano of the Algoma Central Railway Co.'s line, bound for Fort William with a load of steel rails for the Grand Trunk Pacific, struck on Trowbridge island, the most westerly of the Shagwinah group, about three miles east of Thunder Cape, at about 1:30 on the morning of the 17th, and sank in 57 fathoms of water. The crew escaped in two of her boats, the captain's boat making Port Arthur after a twelve hours' sail, having endured great hardships from cold and fatigue. The mate's boat made a landing on Hare island in Thunder Bay, and were picked up on the afternoon of the 17th by the steamer Iroquois, Captain W. H. Wright, Chicago & St. Lawrence Nav. Co., and landed in Fort William. It is almost a miracle that a boat could strike the point she did in that weather and have anybody escape alive.

J. J. O'CONNOR.

Port Arthur, Ont., Nov. 19.



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WITH MARINE MATTERS ON THE
FACE OF THE EARTH.

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November 29, 1906.

SECRETARY ROOT'S SPEECH.

We know of nothing that has been said more helpful to an American merchant marine than that by Secretary of State Root, on Nov. 20, at Kansas City. In well measured and precise terms Mr. Root commits the administration of President Roosevelt to the active support of the pending shipping bill. Being the premier in President Roosevelt's cabinet, Secretary Root would never have said what he did, as he did, except with the president's authority. And what he said leaves no doubt whatever of President Roosevelt's support of the shipping bill that passed the senate last February, and which is to receive the immediate consideration of the house of representatives. Its early passage may therefore all the more confidently be predicted. This means

that the United States is about to begin the work of building up its foreign-going merchant marine in a manner befitting our rank commercially, financially and industrially.

Writ large, therefore, across our political horizon, is a great, powerful and prosperous American merchant marine. Its advent will be surcharged with boundless opportunities, illimitable possibilities and immeasurable good to the American people in particular, and to the whole world in general. The MARINE REVIEW has repeatedly said that all the American people had to do was to study the condition and needs of our shipping in the foreign trade, in order to see to it that effective legislation is speedily adopted, and to further see to it that our deep-sea merchant marine thereafter receive a square deal.

Secretary Root took a trip around South America in an American warship, for the reason that suitable accommodation in a merchant ship was unobtainable. It is the usual custom for travelers between the United States and South American countries to proceed to Europe in order to secure suitable accommodations to South America, or to the United States from South America, as the case may be. The same, to a large extent, is true of our exports to South America; and, of course, the same is equally true of our mail transportation.

Elsewhere will be found the leading features of Secretary Root's great speech. Most earnestly do we commend to our readers a careful and reflective study of that masterly array of facts, figures, arguments and statements. Time thus spent will be well repaid. In the light of that publication, more extended review of what he said is needless here—it is better said by him than we can say it. Summarized, however, Mr. Root found: that the area of South America is twice that of the United States, inclusive of Alaska; the population in 1900 was but 42,461,381; it exports goods worth \$745,530,000 and imports goods worth \$499,858,600; we take from them goods valued at \$152,092,000, and

export to them goods valued at \$63,246,525. Here is what he said we must do in order to increase our trade with them: 1. Send to them agents acquainted with the Spanish and Portuguese languages. 2. Sell them what they want, as they want it. 3. We must establish a credit system according to their wishes. 4. American banks must be established. 5. Investment of American capital is highly desirable; it will earn high rates of interest, on perfectly safe investments, and make more extended and cordial our relations. 6. We must show that we hold them as our equals, and so treat them. 7. Most important of all; WE MUST ESTABLISH LINES OF AMERICAN STEAMSHIPS WITH THE LEADING SOUTH AMERICAN COUNTRIES. Nearly one-half of Secretary Root's speech is given up to this last requirement. In order to secure the establishment of these American steamship lines, he specifically advocates the passage of senate bill No. 529, which passed the senate Feb. 14, 1906, and which is now with the house of representatives.

In his message to congress, next week, we confidently expect that President Roosevelt will equally as explicitly, equally as specifically, commit himself to the advocacy of the passage of that bill. Its passage, we now predict, if followed up as it should be by a further strengthening of our marine in the foreign trade, and as we believe it will be, will stand in history as by long odds the most brilliant and the most beneficial accomplishment of President Roosevelt's administration.

All honor to Secretary Root for his brave words, so timely, so true!

"COMING OUR WAY."

Last week the press of the country was occupied to a most gratifying extent with speeches delivered by eminent men, in public places, in behalf of American shipping. Friendly editorials abound in the great newspapers of the country. It is becoming popular to support the much-abused subsidy bill. People no longer turn pale, and endeavor to run away, when the

subject is referred to. They welcome the discussion of the subject. They find patriotic grounds on which to support the agitation. The more people study the subject, the more people are convinced that the government must help out, and that quickly. Here are some of the things that have happened recently:

1. A congressional commission studied the subject of American shipping, and submitted a report and drafted a bill.

2. The merchant marine commission's bill passed the U. S. senate on Feb. 14, 1906.

3. President Roosevelt repeatedly has expressed the hope that the house will also pass this bill and send it to him.

4. Secretary of State Root has made a great speech in the bill's behalf.

5. Secretary of the Treasury Shaw talks strongly for an American merchant marine, through governmental assistance.

6. Secretary of the Navy Bonaparte has publicly spoken strongly in favor of an American marine as an essential aid to the navy.

7. Postmaster General Cortelyou's last report is strong for American shipping.

8. The house merchant marine and fisheries committee will consider the bill one week from today. Perhaps it will be reported out.

9. President Roosevelt will probably ask congress, in his annual message, on next Monday, to pass the shipping bill.

10. The enemies to American shipping seem to have taken to the tall timber.

11. At last it looks as though things were "coming our way."

Capt. J. J. H. Brown, of Buffalo, has bought the steel steamers Lackawanna and Scranton from John J. McWilliams, of Buffalo. The Lackawanna is now in No. 3 dry dock at Cleveland undergoing repairs incident to her stranding on the breakwater crib at Cleveland. Both vessels were built by the Cleveland Ship Building Co. in 1888.

STEAMER JOHN MITCHELL LAUNCHED.

The steamer John Mitchell building for Charles W. Elphicke of Chicago, was launched at the St. Clair yard of the Great Lakes Engineering Works on Wednesday of this week, and was named by Miss Isabelle Mitchell, daughter of Capt. John Mitchell of Cleveland. This steamer is 440 ft. over all, 420 ft. keel, 52 ft. beam and 28 ft. deep. She has twelve hatches spaced 24-ft. centers. Her engines are triple-expansion with cylin-



CAPT. JOHN MASSEY.

ders 21, 34½, and 57-in. cylinder diameters by 42-in. stroke, supplied with steam from two Scotch boilers, 13 ft. by 12 ft., fitted with induced draft and allowed 175 lbs. pressure. Capt. John Massey will sail the new steamer.

LAST WEEK'S STORM.

The storm which struck the lakes last week was not as serious as first reported. The barges Athens, D. K. Clint and Commodore on Lake Erie and Matanzas on Lake Superior, which were dropped by their steamers and reported lost, are now safe. The Athens was towed to Lorain by the tug Industry. The Clint was found riding safely at anchor off Colchester. The Commodore was picked up and taken to Ashtabula and the Matanzas was taken to Houghton. Probably the most serious loss caused by the storm was that of the Anchor line steamer Conemaugh, which is now regarded as a total loss. She is stranded on the west side of Point Pelee, being broadside on and exposed fully to all westerly winds. The impression is that she cannot be saved. Her arches are broken, three gangways are washed out, and the vessel is full of water.

The steamer Panama, which had the Matanzas in tow, was beached at Min-

eral Point, west of Ontonagon, but Capt. James Davidson, her owner, says that her injuries are not as extensive as first reported. With favorable weather he believes he can lighter enough of her coal cargo to release the steamer.

Scores of vessels were driven to shelter by the storm; many were held up by low water caused by westerly winds at the Lime Kilns, and as the storm came a week earlier than was expected, it has caused many of the smaller class of vessels to go into winter quarters sooner than they thought. Many that are now safely in port will not venture out again during the season.

FREIGHT SITUATION.

The season of 1906 is fast drawing to a close. Heavy weather has already sent a great number of smaller craft into winter quarters, and in general, all barges have made their last trip. Westerly winds have seriously interfered with navigation of the larger craft by lowering the water at the Lime Kilns and private calculations of vessel owners for the last trip have been upset. At some of the ports ore is moving quite slowly, owing to delays inseparable from handling this material in cold and foul weather and at some of the ports, notably Conneaut, some of the shifts on the loading machines are being laid off. There is practically no change in rates. In fact, with the crippling of the service by weather conditions, owners have been more absorbed in looking after their ships than in looking for cargoes.

Following are the receipts and shipments of grain at Duluth for the week ending Nov. 24.

	Receipts.		Shipments.	
	Nov. 24.	Nov. 17.	Nov. 24.	Nov. 17.
Wheat	2,060,765	2,248,985	2,020,897	1,241,260
Oats	6,737	128,197	94,950	8,650
Barley	548,743	514,580	923,222	468,171
Rye	16,839	33,858	28,349
Flax	106,840	1,254,109	1,557,365	633,625

STEAMER J. H. JONES FOUNDERED.

The Canadian steamer J. H. Jones, owned by the Crawford Tug Co., and running between Owen Sound, Ont., and Manitoulin island ports, foundered off Cape Crocker on Thursday last. It is feared that the entire crew and passengers, estimated from twenty-five to forty, have been lost. Part of the wreckage has drifted ashore and some bodies have been recovered. There is no record of a single survivor. The Jones was commanded by Capt. J. B. Crawford, an experienced master, and carried a crew of twelve men. The number of passengers is not known as the steamer was not in the habit of having a booking list. The Jones was a wooden vessel built in 1888 and was 107 ft. long.

Leading Features of Secretary Root's Great Speech on Our Trade with South America.

Last summer Secretary of State Root visited fifteen of the leading seaports of South America in an American war vessel, en route attending the third Pan-American congress, in Brazil. The first of these Pan-American congresses was held in the United States in 1889-90. The second was held five years ago in Mexico. Following are some of the things said by Mr. Root, in a speech delivered before the trans-Mississippi Commercial Congress at Kansas City, on Nov. 20, 1906:

"Immediately before us, at exactly the right time, just as we are ready for it, great opportunities for peaceful commercial and industrial expansion to the south are presented.

"The opportunities are so large that figures fail to convey them.

"The area of South America," he says, is 7,502,848 square miles—"more than double that of the United States including Alaska."

"The latest trade statistics show exports from South America to foreign countries of \$745,530,000 and imports of \$499,858,600."

"Of the five hundred millions of goods that South America buys we sell them but \$63,246,525, or 12.6 per cent."

"Of the \$745,000,000 that South America sells we buy \$152,092,000, or 20.4 per cent, nearly two and a half times as much as we sell."

"The material resources of South America are in some important respects complimentary to our own; that continent is weakest where North America is strongest as a field for manufactures; it has comparatively little coal and iron."

"A large part of their products find no domestic competition here; a large part of our products will find no domestic competition there."

"The typical conditions exist for that kind of trade which is profitable, honorable and beneficial to both parties."

Secretary Root indicates "some of the matters to which every producer and merchant who desires South American trade should pay attention:"

"1. He should learn what the South Americans want and conform his product to their wants. If they think

they need heavy castings he should give them heavy castings and not expect them to buy light ones because he thinks they are better. If they want coarse cottons, he should give them coarse cottons and not expect them to buy fine cottons. It may not pay today but it will pay tomorrow."

2. He suggests that American agents seeking to sell American goods should understand the Spanish and Portuguese languages, in order to establish and maintain the "kindly and agreeable personal relation which is so potent in leading to business relations."

3. The American must arrange to conform his credit system to that prevailing in the country where he wishes to sell his goods.

"4. The establishment of banks should be brought about. The Americans already engaged in South American trade could well afford to subscribe the capital and establish an American bank in each of the principal cities of South America." Capital is much needed there, he says; six, eight and ten per cent can be obtained on perfectly safe security; such banks would furnish information as to credits, and "American banks would relieve American business in South America from the disadvantage which now exists of making all its financial transactions through Europe instead of directly with the United States."

5. Mr. Root urges us to cultivate and show the proper respect for South Americans—least of all assume our superiority and their inferiority.

"6. The investment of American capital in South America under the direction of American experts should be promoted, not merely upon simple investment grounds, but as a means of creating and enlarging trade."

"7. It is absolutely essential that the means of communication between the two countries should be improved and increased.

"This underlies all other considerations and it applies both to the mail, the passenger and the freight services. Between all of the principal South American ports, and England, Germany, France, Spain, Italy, lines of swift and commodious steamers ply regularly. There are five subsidized

first-class mail and passenger lines between Buenos Aires and Europe; there is no line between Buenos Aires and the United States." Out of 3,330 vessels entering Rio de Janeiro no American steamers and but seven sailing vessels of the United States entered, two of the latter being in distress! "An English firm runs a small steamer monthly between New York and Rio de Janeiro; the Panama Railroad Co. runs steamers between New York and the Isthmus of Panama; the Brazilians are starting for themselves a line between Rio and New York. That is the sum total of American communications with South America beyond the Caribbean sea. Not one American steamship runs to any South American port beyond the Caribbean."

Secretary Root saw one vessel, besides the U. S. cruiser on which he was conveyed, flying the American flag, in fifteen South American ports he visited. "The mails between South America and Europe are swift, regular and certain; between the United States and South America they are slow, irregular and uncertain. Six weeks is not an uncommon time for a letter to take between Buenos Aires or Valparaiso and New York." Hence deliveries of goods are uncertain; freight rates are higher than between South American and European cities. "The passenger accommodations are such as to make a journey to the United States a trial to be endured and a journey to Europe a pleasure to be enjoyed. The best way to travel between the United States and both the west coast and the east coast of South America is to go by way of Europe, crossing the Atlantic twice."

"The true remedy and the only remedy is the establishment of American lines of steamships between the United States and the great ports of South America, adequate to render fully as good service as is now afforded by the European lines between those ports and Europe."

As to how to remedy it, he thinks "the answer is twofold."

"1. The higher wages and the greater cost of maintenance of American officers and crews make it impossible to compete on equal terms with foreign ships. The scale of living

and the scale of pay of American sailors is fixed by the standard of wages and of living in the United States, and those are maintained at a high level by the protective tariff. The moment the American passes beyond the limits of his country and engages in ocean transportation he comes into competition with the lower foreign scale of wages and of living."

"2. The principal maritime nations of the world, anxious to develop their trade, to promote their ship building industry, to have at hand transports and auxiliary cruisers in case of war, are fostering their steamship lines by the payment of subsidies. It is estimated that about \$28,000,000 a year are paid by our commercial competitors to their steamship lines."

"Against these disadvantages to his competitor the American ship owner has to contend; and it is manifest that the subsidized ship can afford to carry freight at cost for a long enough period to drive him out of business."

"We are living in a world not of natural competition, but of subsidized competition. State aid to steamship lines is as much a part of the commercial system of our day as state employment of consuls to promote business."

"It will be observed that both of these disadvantages under which the American ship owner labors are artificial; they are created by governmental action, one by our own government in raising the standard of wages and living, by the protective tariff, the other by foreign governments in paying subsidies to their ships for the promotion of their own trade. For the American ship owner it is not a contest of intelligence, skill, industry and thrift against similar qualities in his competitors; it is a contest against his competitors' governments and his own government also."

"Plainly these disadvantages created by governmental action can be neutralized only by governmental action, and should be neutralized by such action."

"What action ought our government to take for the accomplishment of this just purpose? Three kinds of action have been advocated."

Mr. Root points out the utter impracticability of free ships; he points out that other nations that have tried it have been compelled to resort to state aid to build up their shipping. Discriminating tariff duties he also regards as impracticable for several reasons, including the many existing treaties forbidding it. "To sweep away all those treaties and enter upon a war of commercial retaliation and

reprisal for the sake of accomplishing indirectly what can be done directly should not be seriously considered."

"3. There remains the third and obvious method: to neutralize the artificial disadvantages imposed upon American shipping through the action of our own government and foreign governments by an equivalent advantage in the form of a subsidy or subvention. In my opinion this is what should be done; it is the sensible and fair thing to do. It is what must be done if we would have a revival of our shipping and the desired development of our foreign trade. We cannot repeal the protective tariff; no political party dreams of repealing it; we do not wish to lower the standard of American living or American wages. We should give back to the ship owner what we take away from him for the purpose of maintaining that standard; and unless we do give it back, we shall continue to go without ships. Such subventions would not be gifts. They would be at once compensation for injuries inflicted upon American shipping by American laws and the consideration for benefits received by the whole American people—not the shippers or the ship builders or the sailors alone, but for every manufacturer, every miner, every farmer, every merchant whose prosperity depends upon a market for his products."

"The provisions for such just compensation should be carefully shaped and directed so that it will go to individual advantage only so far as the individual is enabled to earn by it a reasonable profit by building up the business of the country."

"A BILL IS NOW PENDING IN CONGRESS WHICH CONTAINS SUCH PROVISIONS; IT HAS PASSED THE SENATE AND IS NOW BEFORE THE HOUSE COMMITTEE ON MERCHANT MARINE AND FISHERIES; IT IS KNOWN AS SENATE BILL NO. 529, FIFTY-NINTH CONGRESS, FIRST SESSION." Mr. Root then briefly recapitulates its leading provisions, as to mail lines, concluding this detailed presentation of the bill with the following observation: "THE PAYMENTS PROVIDED ARE NO MORE THAN ENOUGH TO GIVE THE AMERICAN SHIPS A FAIR LIVING CHANCE IN THE COMPETITION." He also adds:

"THERE ARE OTHER WISE AND REASONABLE PROVISIONS IN THE BILL RELATING TO TRADE WITH THE ORIENT, TO TRAMP STEAMERS AND TO A NAVAL RE-

SERVE, BUT I AM NOW CONCERNED WITH THE PROVISIONS FOR TRADE TO THE SOUTH. THE HOPE OF SUCH TRADE LIES CHIEFLY IN THE PASSAGE OF THAT BILL."

Mr. Root quotes from the last annual report of the postmaster general, showing that under existing law bids cannot be secured for mail lines to South America, because the compensation provided is inadequate. Says Mr. Root:

"It is difficult to believe, but it is true, that out of this faulty ocean mail service the government of the United States is making a large profit. The actual cost to the government last year of the ocean mail service to foreign countries other than Canada and Mexico was \$2,965,624.21, while the proceeds realized by the government from postage between the United States and foreign countries other than Canada and Mexico was \$6,008,807.53, leaving a profit to the United States of \$3,043,183.32."

Secretary Root quotes from the last annual message of President Roosevelt to congress, showing how the president urges legislation that will give us an American merchant marine. Mr. Root continues:

"The bill now pending in the house is a bill framed upon the report of that merchant marine commission. THE QUESTION WHETHER IT SHALL BECOME A LAW DEPENDS UPON YOUR REPRESENTATIVES IN THE HOUSE. YOU HAVE THE JUDGMENT OF THE POSTMASTER GENERAL, YOU HAVE THE JUDGMENT OF THE SENATE. YOU HAVE THE JUDGMENT OF THE PRESIDENT; IF YOU AGREE WITH THESE JUDGMENTS AND WISH THE BILL WHICH EMBODIES THEM TO BECOME A LAW, SAY SO TO YOUR REPRESENTATIVES. SAY IT TO THEM INDIVIDUALLY AND DIRECTLY, FOR IT IS YOUR RIGHT TO ADVISE THEM AND IT WILL BE THEIR PLEASURE TO HEAR FROM YOU WHAT LEGISLATION THE INTERESTS OF THEIR CONSTITUENTS DEMAND."

"It is for you and the business men all over the country whom you represent, to show to the representatives in congress that the producing and commercial interests of the country really desire a practical measure to enlarge the markets and increase the foreign trade of the United States, by enabling American shipping to overcome the disadvantages imposed upon it by foreign governments for the benefit of their trade and by our government for the benefit of our home industry."

SCIENTIFIC LAKE NAVIGATION

By Clarence E. Long

SOME PRACTICAL EXAMPLES.

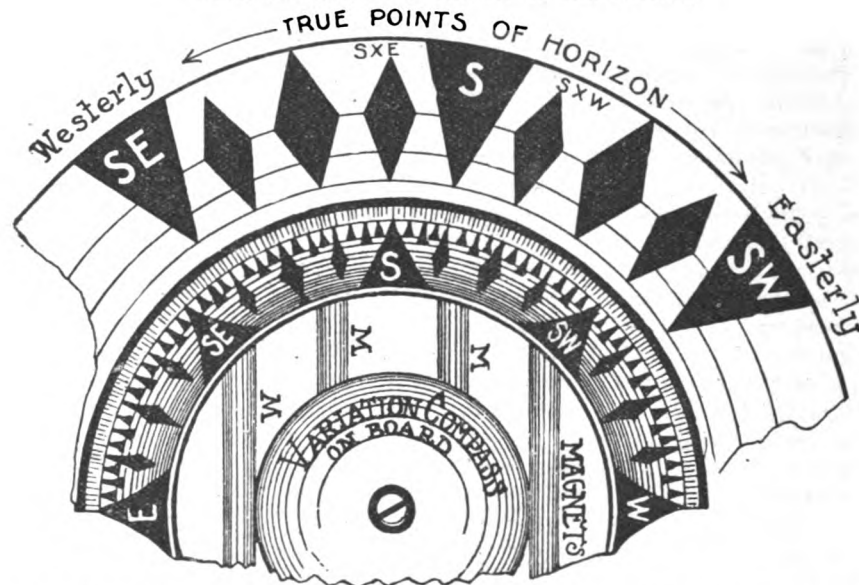
Now, we will take some practical examples which come up in every-day lake navigation:

The lighthouses of Frying Pan and Pipe islands range true N $\frac{3}{8}$ W, variation for that locality 4° Wly. How should your compass read when on with this range if there were no deviation, or what is the c. m. bearing of this range? Answer north; 4° , for all practical pur-

ought to read when on with this range provided there was no deviation? Answer, E $\frac{3}{8}$ S. For practical purposes 6° equals $\frac{1}{2}$ point, and as the variation is Wly. allow to the right, and $\frac{1}{2}$ point to the right of E $\frac{1}{8}$ N is E $\frac{3}{8}$ S.

The true bearing of the Milwaukee piers is E $\frac{1}{4}$ N, variation 3° Ely. How had your compass ought to read if it were correct, in going out parallel with piers. Answer, E $\frac{1}{2}$ N 3° is equal to $\frac{1}{4}$

WHEN SOUTH IS MADE THE TOP OF THE COMPASS.



Showing westerly variation (1-point). Is not the inner compass turned to the left of the outer compass? The inner compass is affected by variation only while the outside compass shows the true points of the horizon at any place. This cut was incorrectly assembled last week and is herewith republished in corrected form.

poses, equals $\frac{3}{8}$ of a point, and as the variation is Wly. it is allowed to the right of the true bearing, and $\frac{3}{8}$ of a point to the right of N $\frac{3}{8}$ W is north. The c. m. back range (over stern) of these lights would be south, the true range being S $\frac{3}{8}$ E.

The St. Clair Flats canal runs true N E $\frac{3}{8}$ N and S W $\frac{3}{8}$ S, the variation for that locality being $1^\circ 30'$ Wly. What is the correct magnetic course through the canal, or in other words how should your compass read if there were no deviation? Answer N E $\frac{1}{4}$ N; $1^\circ 30'$ being practically $\frac{1}{8}$ of a point, and it being Wly. is allowed to the right; and $\frac{1}{8}$ to the right of N E $\frac{3}{8}$ N is N E $\frac{1}{4}$ N. The reverse direction correct magnetic would be S W $\frac{1}{4}$ S.

The true bearing of the lighthouse on the north end of Buffalo breakwater when in range with the lighthouse on the south pier at the entrance to Buffalo, is E $\frac{1}{8}$ N, variation 6° Wly., what is the c. m. bearing, or how had your compass

point, that is, it is nearer to $\frac{1}{4}$ point than anything else; and $\frac{1}{4}$ point to the left (the variation is Ely. in this case—allow to the left) of E $\frac{1}{4}$ N, the true bearing of these piers, and this is the way your compass should read going out of there to be correct.

The true bearing of the Duluth harbor piers is S W by W $\frac{7}{8}$ W, variation 8° Ely. How had your compass ought to read when in line with the piers going in; or what is the c. m. bearing of these piers? Answer, S W by W $\frac{1}{8}$ W; 8° is nearer equal to $\frac{3}{4}$ of a point, and as the variation is Ely. and allowed to the left, therefore moving to the left of S W by W $\frac{7}{8}$ W true brings S W by W $\frac{1}{8}$ W correct magnetic.

CORRECTING COURSES BY THE NUMBER OF THE POINT IN EACH COURSE.

This system of notation recommends itself as a handy and convenient method of correcting courses, and the conversion of one kind into another; and more especially where it is required to keep a

record course sheet, and also in this kind of work in the examinations before the board of steamboat inspectors. In the chapter on the compass we made the student acquainted with the significance of these terms and showed him the reason and principle for so naming them; and too, called attention to the importance of familiarizing himself with same.

The points of the compass are frequently spoken of in calculation with reference to their position to the RIGHT or LEFT of the cardinal point towards which the spectator, who is supposed to be placed in the center of the compass, is looking.

Supposing the given point of the compass to have north in it, then looking from the center of the card over the cardinal point north, he has the quadrant from north to east on his right hand, and the quadrant from north to west on his left hand; thus, N E is said to be "four points" to the right of north, and NNW "two points" to the left of north, and so on.

Again, suppose the given point of the compass to have south in it, then the observer looking from the center of the card and facing south, has the quadrant from south to east on the LEFT hand, and the quadrant from south to west on the RIGHT hand; thus, SE by S is said to be "three points" to the LEFT of S, and W by S is "seven points right of south," and so on.

Hence, any point or degree between north and east is said to be to right of north; and between north and west to the left of north; and between south and east to the left of south; and between south and west to the right of south. For example; NNE is two points right of north (for shortness written 2 points (pts) R of N) and WNW is six points left of north (6 pts. L of N); SE by S is 3 pts. L of S and W by S is 7 pts. R of S.

GET FAMILIAR WITH THE COMPASS CARD.

The learner should so familiarize himself with the compass card as to be able to turn the name of the compass point of any course into its numerical value, or the number of degrees corresponding thereto, instantly, and when you have acquired such knowledge, you will find the following rule serviceable. Rules:

Put down the points and quarter points which the true course is to the right or left of north and south, marking them R or L accordingly.

Underneath put the variation, marking

it also R or L, according as it is easterly or westerly.

If the names are alike, take the sum, with the name for the correct magnetic course.

When the sum amounts to 8 points, it is either east or west.

When the sum exceeds 8 points, take it from 16 points; the remainder is the correct magnetic course to be reckoned from the reverse point to that which the true course is reckoned from. That is, it is to be reckoned from the north if it had previously been reckoned from the S, but is to be marked S if previously marked N; also, if marked L (left) change to R (right); but if marked R change to L.

If the names are unlike, take the difference, and mark it the same name as the greater.

If the variation, being subtractive, exceeds the amount from which it is to be subtracted, take the points of the course from the variation, and name it (the course) right if it had previously been left, but towards the left if it had been right.

Also bear in mind that 0 points is either north or south, as the case may be.

TREATING THE POINTS NUMERICALLY.

Following are examples treating the points of the compass numerically, with explanations of this system of notation:

Taking the course between north and south round by east:

The T C (abbreviation for true course) is NE by E, variation $2\frac{3}{4}$ points Ely., to find the c. m. c. Here the true course is N 5 points E, and the variation is Ely. and hence must be applied to the LEFT, thereby bringing it $2\frac{3}{4}$ points nearer to the north (N 5 E — $2\frac{3}{4}$ equals N $2\frac{1}{4}$ E) that is within $2\frac{1}{4}$ points of north; the c. m. c. is therefore NNE $\frac{1}{4}$ E.

The T C is the same, viz., (viz. means namely) NE by E, variation $1\frac{3}{4}$ Wly. Here the T C is N 5 points E, and the variation is Wly., and hence must be applied to the right, thereby carrying the course away from the N towards the E, that is, $6\frac{3}{4}$ points to the eastward of north (N 5 + $1\frac{3}{4}$ equals N $6\frac{3}{4}$ E); the c. m. c. is therefore E by N $\frac{1}{4}$ N.

The remainder of the examples will explain themselves. The student cannot help appreciating the simplicity and exactness of this method.

T C SE, variation $1\frac{1}{4}$ points Wly., then the c. m. c. (allowing variation to the right) will be SSE $\frac{3}{4}$ E, or S $2\frac{3}{4}$ points E.

But T C SE, variation $2\frac{1}{2}$ points Ely., then the c. m. c. (allowing the variation to the left) will be E by S $\frac{1}{2}$ S, or S $6\frac{1}{2}$ points E.

T C NNE, variation $2\frac{1}{4}$ points Ely., the c. m. c. $2\frac{1}{4}$ points to the left hand of NNE, is N $\frac{1}{4}$ W.

T C S by E, variation $2\frac{1}{4}$ Wly., $2\frac{1}{4}$ points allowed to the right of S by E is S by W $\frac{1}{4}$ W, or S $1\frac{1}{4}$ W.

T C east, variation 2 points Ely., then allowing 2 points to the left gives c. m. c. ENE.

T C east, variation $2\frac{3}{4}$ points Wly., then the c. m. c.—allowing the variation to the right hand—is SE by E $\frac{1}{4}$ E.

Now proceeding to the courses between north and south round by west.

T C NW $\frac{1}{2}$ W, variation 2 points points Ely., the c. m. c.—allowing variation to the left—will be W by N $\frac{1}{2}$ N or N $6\frac{1}{2}$ points W.

Taking the same T C, viz., NW $\frac{1}{2}$ W, when the variation is $1\frac{1}{2}$ points Wly., the c. m. c.—allowing the variation to the right—will be NW by N, or N 3 points W.

Again, T C SW by S, variation $2\frac{3}{4}$ points Ely., the c. m. c.—allowing variation to the left—will be S $\frac{1}{4}$ W.

T C SW by S, as before, variation $1\frac{3}{4}$ Wly., the c. m. c.—allowing variation to the right—will be SW $\frac{3}{4}$ W, or S $4\frac{3}{4}$ points W.

T C SSW, variation $3\frac{1}{2}$ Ely., then allowing $3\frac{1}{2}$ points to the left of SSW, gives S by E $\frac{1}{2}$ E, or S $1\frac{1}{2}$ points E.

T C W, variation $2\frac{1}{2}$ Wly., then the c. m. c.—allowing $2\frac{1}{2}$ points to the right—is NW by W $\frac{1}{2}$ W, or N $5\frac{1}{2}$ points W.

But with T C west and variation $3\frac{1}{4}$ Ely., then allowing $3\frac{1}{4}$ points to the left of W, the c. m. c. is SW $\frac{3}{4}$ W, or S $4\frac{3}{4}$ points W.

T C NNW $\frac{1}{2}$ W, variation $3\frac{1}{4}$ points Wly., then $3\frac{1}{4}$ points to the right of WNW $\frac{1}{2}$ W, is N $\frac{3}{4}$ W.

The following are examples of this method of applying the variation, and the letters are the abbreviations:

The true courses are: SSW; N by E $\frac{1}{2}$ E; and E by N, variation $1\frac{1}{2}$ points Wly. Required the correct magnetic courses:

T C SSW = 2 pts. R of S
Var. Wly. $1\frac{1}{2}$ " R

C. M. C. $3\frac{1}{2}$ " R of S = SW $\frac{1}{2}$ [S]

T C N by E $\frac{1}{2}$ E = $1\frac{1}{2}$ pts. R of N
Var. Wly. $1\frac{1}{2}$ " R

C. M. C. 3 " R of N
True course E by N = 7 pts. R of N
Var. westerly $1\frac{1}{2}$ " R

Correct mag. course $-8\frac{1}{2}$ " R of N
16 "

$7\frac{1}{2}$ " L of S
[E $\frac{1}{2}$ S]

True course NNW = 2 pts. L of N
Var. $2\frac{1}{2}$ p. Ely. $2\frac{1}{2}$ " L

Cor. mag. course $4\frac{1}{2}$ " L of N = [NW $\frac{1}{2}$ W]

True course S by E = 1 pt. L of S
Var. $2\frac{1}{2}$ p. Ely. $2\frac{1}{2}$ " L

Cor. mag. course $3\frac{1}{2}$ " L of S = [SE $\frac{1}{2}$ S]

True course W $\frac{1}{2}$ N = $7\frac{1}{2}$ pts. L of N
Var. Ely. $2\frac{1}{2}$ pts. $2\frac{1}{2}$ " L

Cor. mag. course -10 " L of N
16

6 " R of S
[=WSW]

True course E by S = 7 pts. L of S
Variation Ely. $2\frac{1}{2}$ " L

Cor. mag. course $-9\frac{1}{2}$ " L of S
16

$6\frac{1}{2}$ pts. R of N
[=ENE $\frac{1}{2}$ E]

True course NW by W = 5 pts. L of N
Variation Wly. $3\frac{1}{4}$ " R

Correct mag. course $1\frac{3}{4}$ " L of N
[=N by W $\frac{3}{4}$ W]

True course is NNE = 2 pts. R of N
Variation Ely. 2 " L

Correct mag. course 0 = north
True course is S by E = 1 pt. L of S
Variation Wly. 1 " R

Correct mag. course 0 = south
True course W by S = 7 R of S
Variation Wly. 1 R

Correct mag. course 8 R of S = west
True course is ESE = 6 L of S
Variation Ely. 2 L

Correct mag. course 8 L of S = east

The true courses are north, variation 2 points Wly.; south, variation 2 points Ely.; west, variation 2 points Ely.; and east, variation 2 points Wly.

North = 0
Variation Wly. 2 R of N

C. M. C. 2 R of N = NNE

South = 0
Variation Ely. 2 L of S

C. M. C. 2 L of S = SSE

West = 3 R of S
Variation Ely. 2 L

C. M. C. 6 R of S = WSW

East = 8 L of S
Variation Wly. 2 R

C. M. C. 6 L of S = ESE

Note.—In the last two examples west could also be 8 points L of N; it would

amount to the same thing, but the operation would be longer, for instance, 8 points L of N and variation 2 points L would make 10 points L of N, and 10 points L of N is WSW, but according to the rules when the course exceeds 8 points take it from 16 points and reckon from the opposite way. By working it as given above this does away with all unnecessary work. The same with east.

QUESTIONS FOR MASTERS AND MATES.—NO. 20.

295. Why is it that the variation is the same for all vessels and on all points of the compass while the deviation is different for different vessels and different nearly on all points of the compass?

296. The true course is N by E $\frac{1}{2}$ E and the correct magnetic course is N $\frac{1}{4}$ W, how much is the variation and which way is it?

297. The correct magnetic course is SE $\frac{1}{2}$ E and the true course is ESE, what is the variation and which way is it?

298. The true course is SW $\frac{1}{4}$ S and the correct magnetic course is S 50° W, what is the variation and which way is it?

299. The correct magnetic bearing of a range is NNW $\frac{1}{2}$ W, the variation is 6° westerly, what is the true bearing of the range?

300. The variation is 4° easterly, what should the north star bear by compass, or what is the correct magnetic bearing of the north star when the variation is 4° easterly?

301. What is the correct magnetic direction of Cleveland piers?

302. A correct magnetic bearing of the north star was N 8° W, what is the variation and which way is it?

303. What is the correct magnetic bearing of the Chicago Four-Mile Waterworks Crib light when in range with the light on the southeast end of Chicago breakwater?

304. Is it necessary in order to make good courses to know your distance off at turning points in your course? How would you determine this distance?

305. In running along with the land in the night time, how could you tell whether you were working in or out by lights on the shore? Explain just how you would control the situation.

306. On a straight course from Southeast shoal lightship to Buffalo, in thick weather, having run out your time to Long Point, and cannot hear Long Point fog whistle, how would you locate yourself?

307. If you are making 11 $\frac{1}{4}$ miles

per hour, how long does it take you to make a mile?

308. Your boat makes 11 miles an hour with the engine turning up 85 revolutions per minute, how much must the engine turn up to make six miles per hour?

309. Turning up 90 turns your boat makes 11 $\frac{1}{4}$ miles, how fast is your boat running when the engine is slowed down to 70 turns per minute?

QUESTIONS FOR WHEELSMEN AND WATCHMEN.—NO. 21.

211. If you were navigating boat up Sault river at night, and after passing head of Lime island you suddenly see Round island light turn red, what would you tell wheelsman to do?

212. When abreast and close to Lime island dock, bound up, the weather set in thick, what mark could be used to safely navigate vessel clear of Point Au Frenes and Hay island shoals?

213. Tell what marks you could use in making the turn at Point Au Frenes to head up on Mud lake turning beacon.

214. With your boat heading on Winter Point ranges your steering compass reads NW, how near correct is it on that heading?

215. What is the true bearing of Pilot island ranges?

216. How is the channel around Johnson's Point marked?

217. What is the correct magnetic bearing of Point of Woods ranges (American)?

218. In making the turn at the Dark Hole, what mark have you to bring the stern of your boat on Dark Hole ranges?

219. Heading on Harwood Point ranges, how should your compass read if it was free from deviation?

220. In making the turn at the intersection of Harwood Point and Stribbling Point ranges, what marks can be used if the gas buoys have been taken in for the winter or before they are placed in the spring?

QUESTIONS FOR OILERS AND WATERTENDERS.—NO. 16.

161. What is a hydrometer and for what purpose is it used?

162. At what density is the water in marine boilers usually carried?

163. What effect has the deposit of sediment or scale on steam boilers?

164. What are the means adopted to prevent the formation of scale?

165. In scaling a water-tube boiler, what would you suggest to be done?

166. If the power is stored up in coal, why do we use steam?

167. Why do they condense the steam in modern engines?

168. How do you make the vacuum in a condensing engine and how do you maintain same?

169. Why does condensing the used steam make a vacuum?

170. Suppose you had a weak tube, how could you strengthen it?

TRADE NOTES.

The Atlantic Works, Inc., 28th St. and Gray's Ferry road, Philadelphia, Pa., have received an order from S. Gildersleeve & Sons, Gildersleeve, Conn., for one of their B-17 adjustable bevel band saw machines, which they build especially for ship yard work.

The Ashton Valve Co., 271 Franklin St., Boston, are the first in the field with a 1907 calendar. Printed upon a cream stock without any background whatever is a very fetching head of a girl in several colors, the drawing being skillful and the lithograph work is especially well done.

The Crandall Packing Co., has moved its Cleveland offices from No. 9 South Water St., to the Wade building, No. 805 Superior St., to far more commodious quarters. The stock has been greatly enlarged in order that the company may care for its growing stationary and marine business, which is being handled from the Cleveland office. The company has just put out a catalog descriptive of Crandall packing. The catalog is very thorough and gives a good description of the various styles of packing manufactured by the company. It will be sent to anyone interested upon request.

The whaleback steamer Bay City, bound down with ore with the barges Bombay and Baroness in tow broke down last week when about eight miles below Colchester. Tugs were sent out and the Bay City and Baroness were towed to Cleveland and the Bombay to Lorain.

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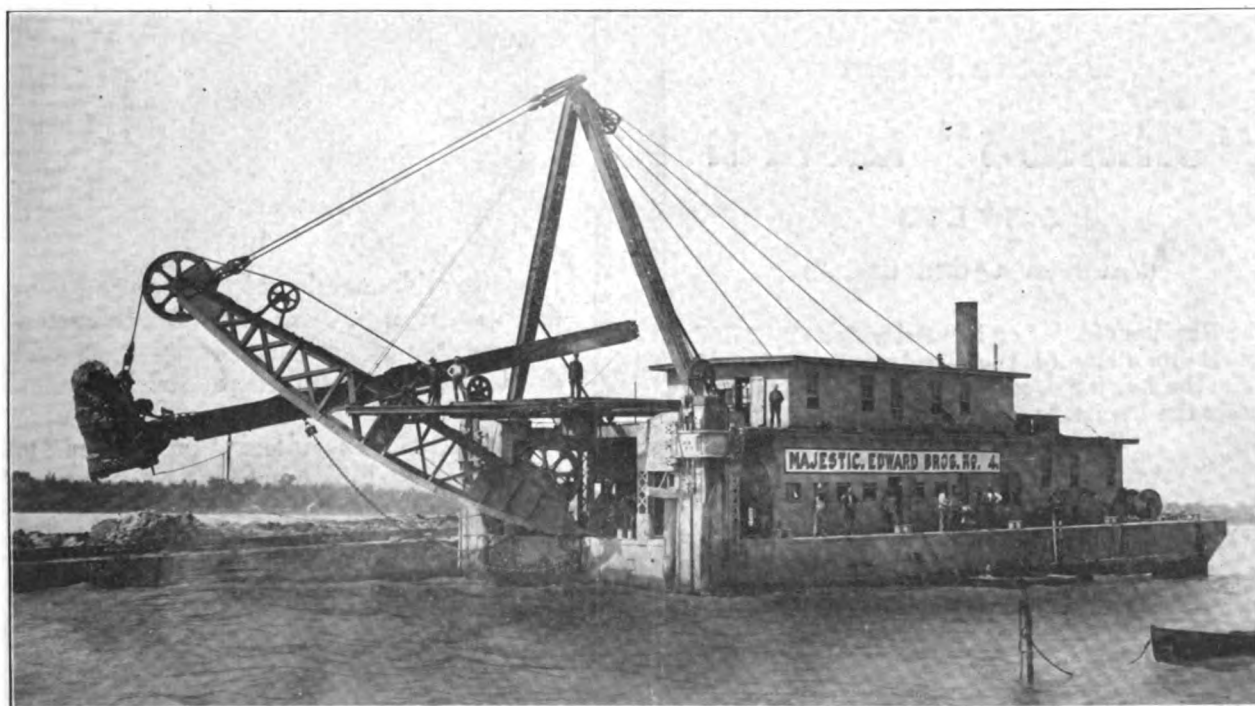
THE MARINE REVIEW

VOL. XXXIV.

CLEVELAND, NOVEMBER 29, 1906.

No. 22.

Manitowoc Dry Dock Company MANITOWOC, WISCONSIN



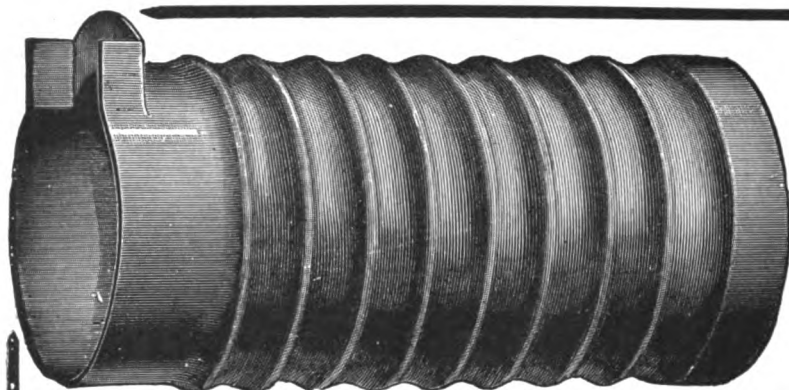
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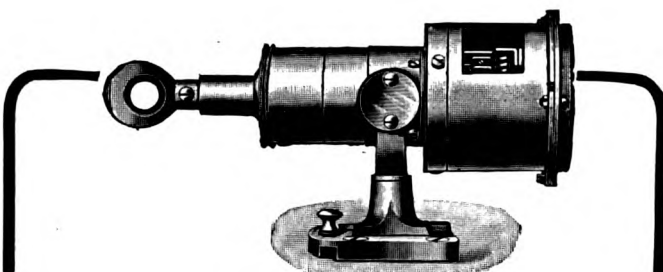
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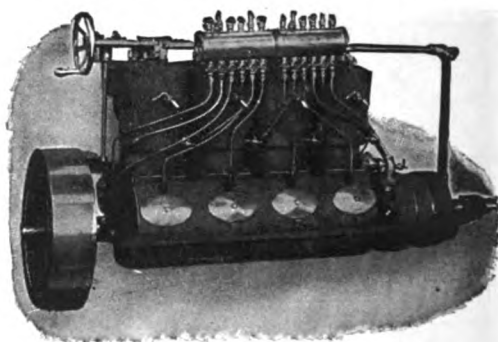
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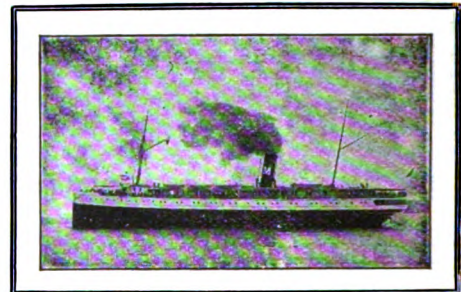
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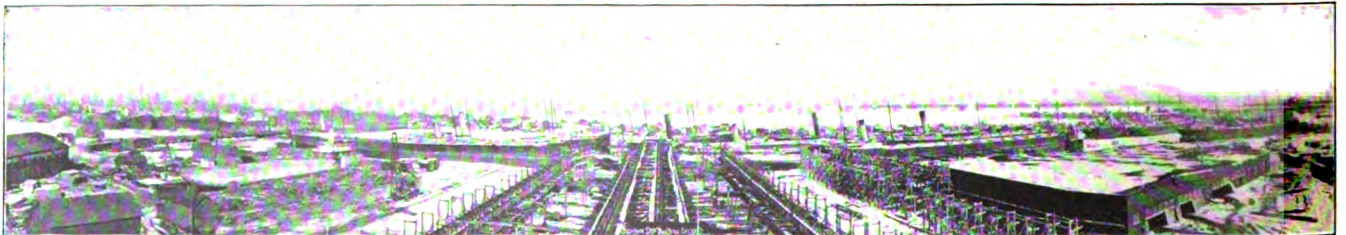


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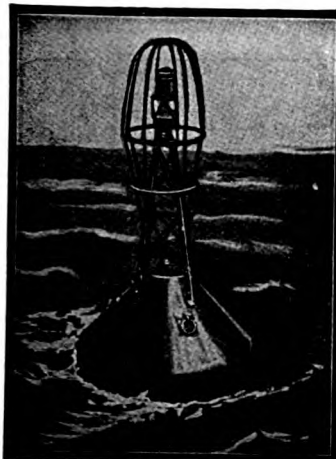
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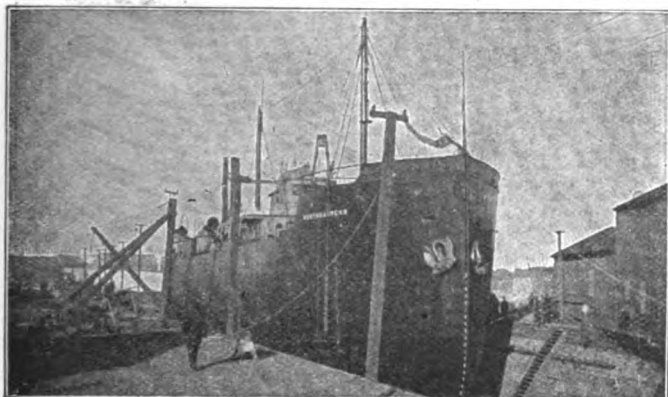
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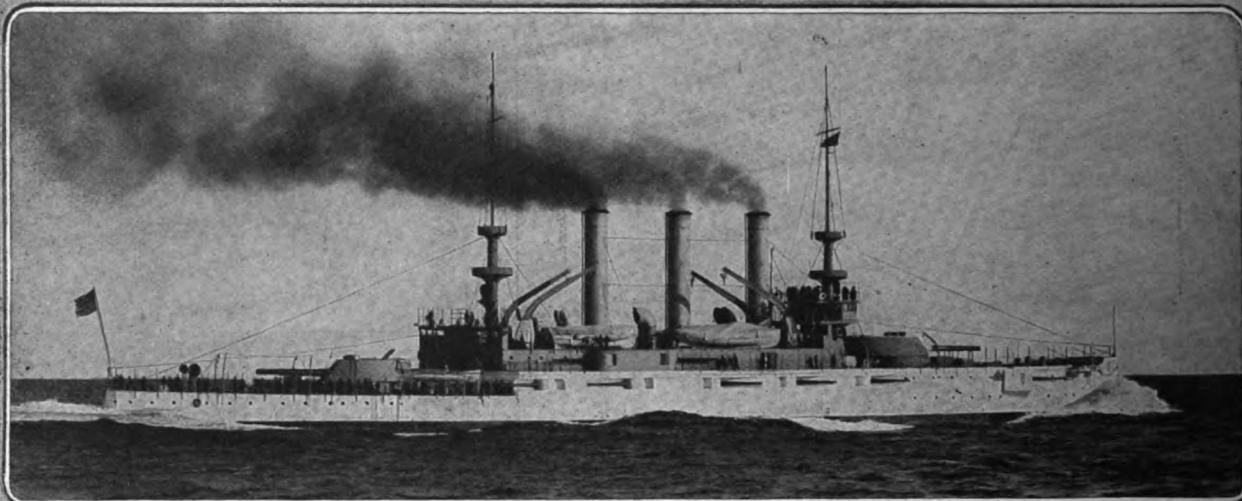
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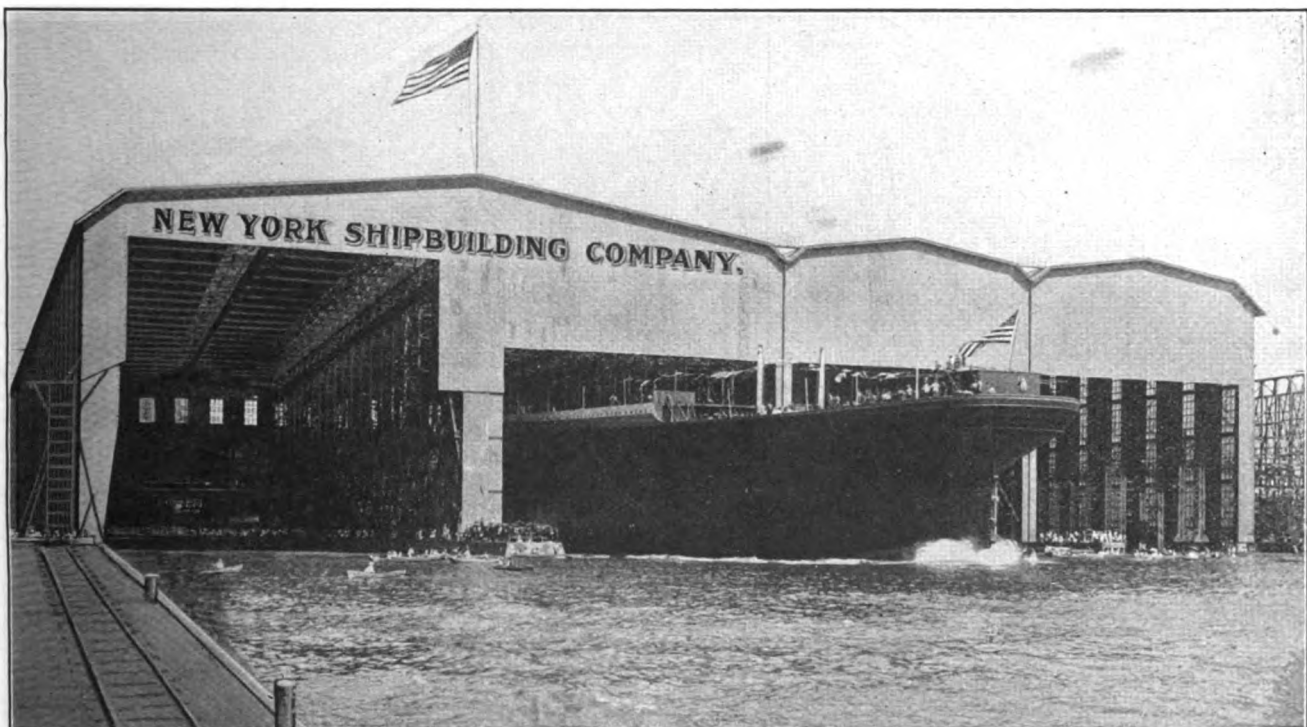
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CONTENTS

Introduction
Variation
Deviation
How to find the Deviation
Leeway
The Log
The Lead-Line
Charts
Chart Sailing
Dead-Reckoning
Examples for Practice
Working a Traverse
How to
Shaping the Course
Navigation by Observation
Sextant Adjustments
Index Error
Hints on Taking Altitudes
Correcting the Altitude
The Chronometer
The Nautical Almanac
Apparent and Mean Time—The Equation
Latitude by Meridian Altitude
Latitude by Meridian Altitude of a Star
Latitude by Meridian Altitude of a Planet
Latitude by Meridian Altitude of the Moon
Meridian Altitude below the Pole
Latitude by Ex-Meridian Altitude of the Sun
Latitude by the Polestar

Compass Error by Azimuths
Longitude by Chronometer (or Time) Sight
Remarks on Longitude
Longitude by Sunrise and Sunset
Sights
Chronometer Sight of a Star
Sumner's Method
Example of Sumner's Method with the Sun
Example of Sumner Lines with Two Stars
Great-Circle Sailing
Distance and Danger Angles
Allowance for Tides
Keeping the Log
Rating a Chronometer
Care of a Chronometer
Hints on Conducting Voyages
Examples for Practice:
Dead-Reckoning
Shaping Course by Mercator's Sailing
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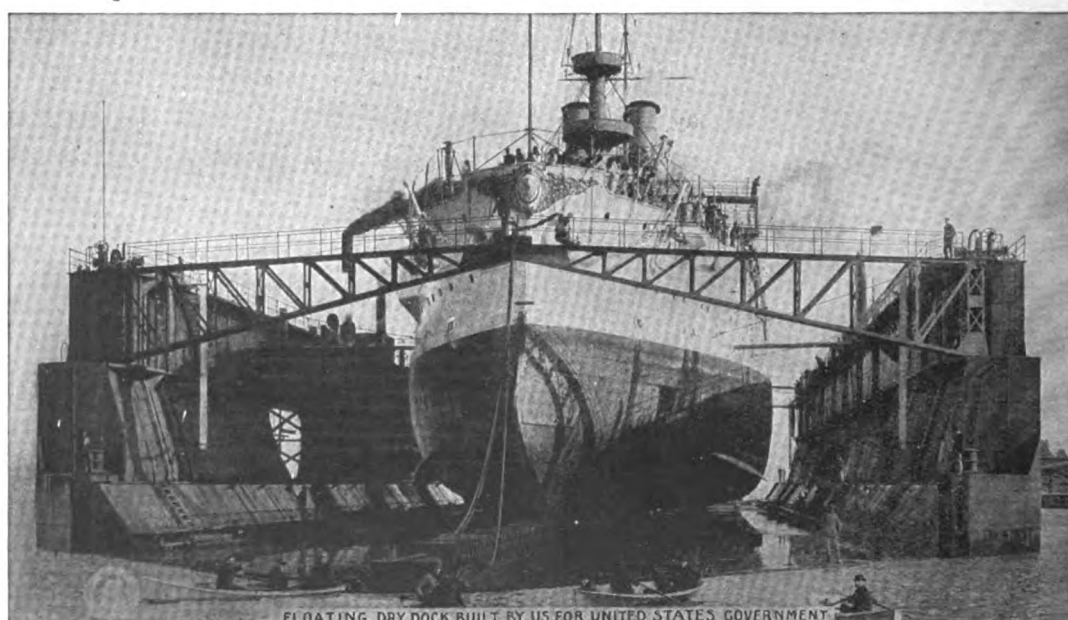
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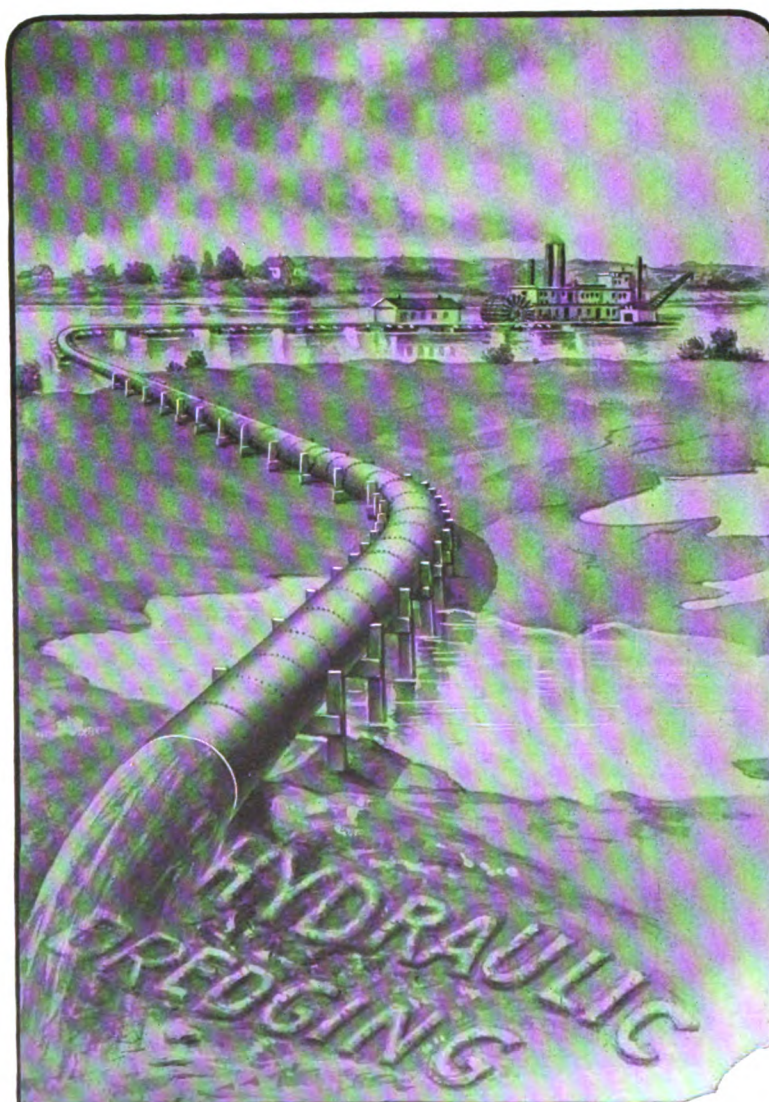
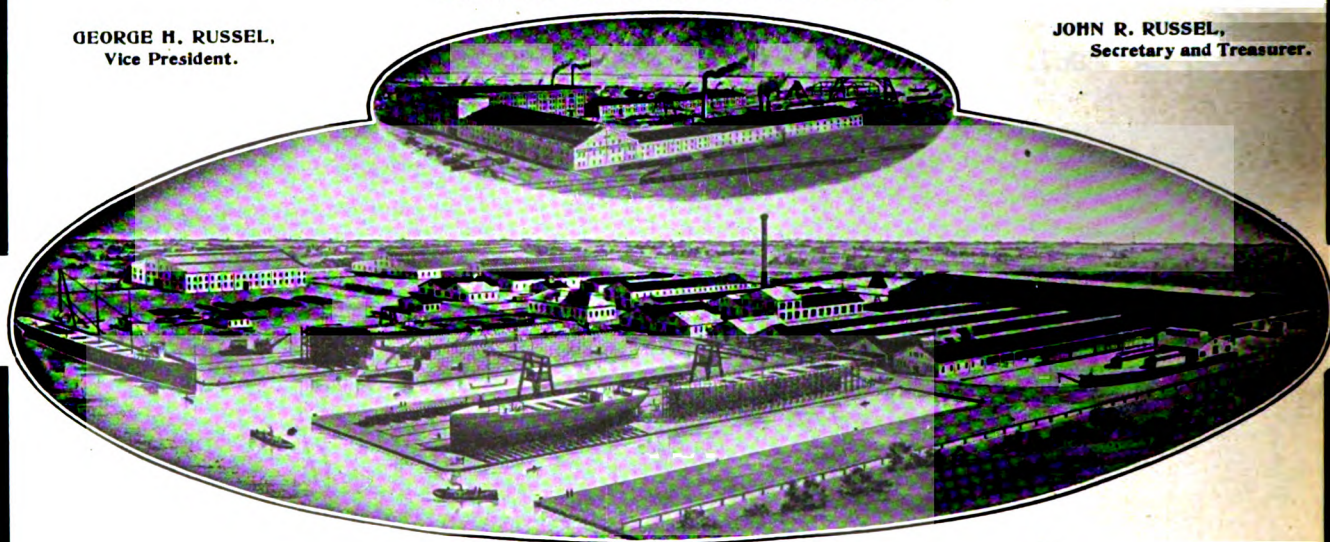
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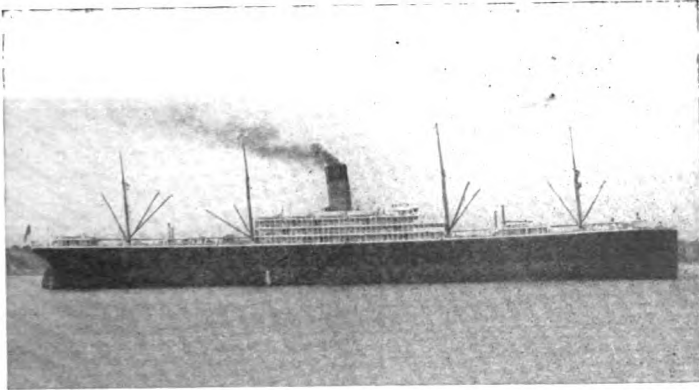
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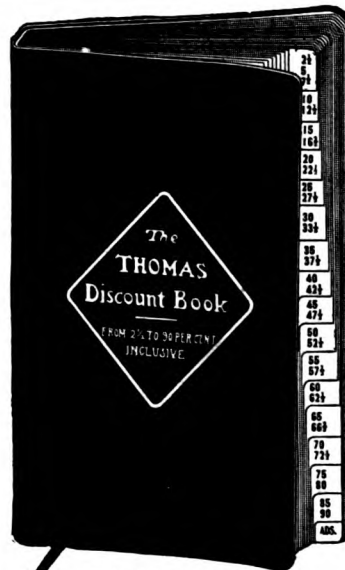
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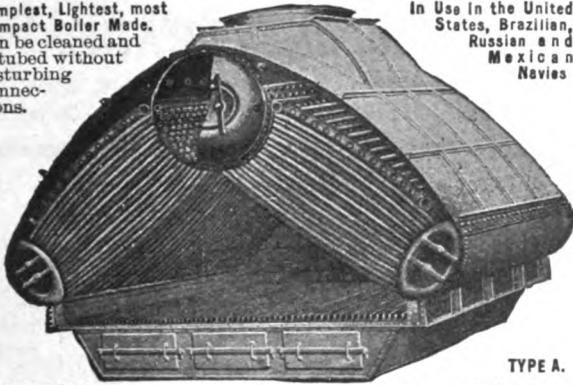
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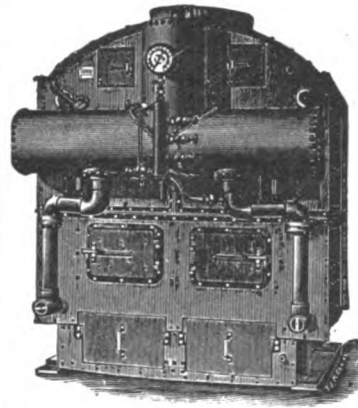
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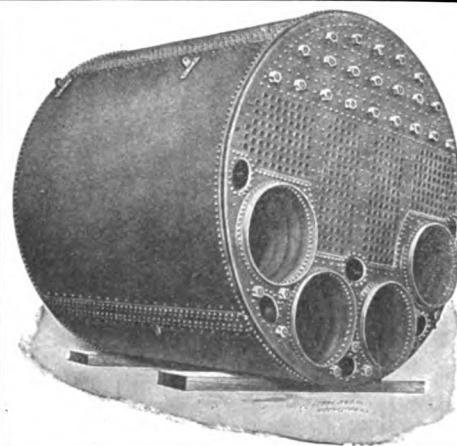


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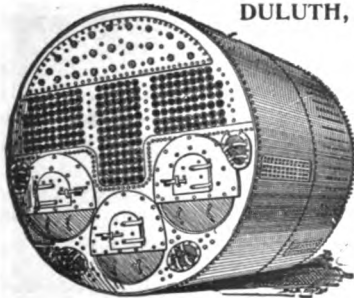
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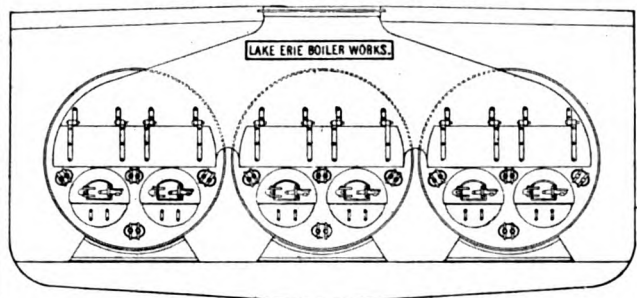
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For a more complete classification than that represented by advertisers in The Marine Review, see the BLUE BOOK OF AMERICAN SHIPPING, Marine and Naval Directory of the United States, published by The Marine Review, Cleveland.

[See accompanying Index of Advertisers for full addresses of concerns in this Directory.]

AIR COMPRESSION, HOISTS.
Great Lakes Engineering Works....
.....Detroit.

AIR PORTS, DEAD LIGHTS, ETC.
Marine Mfg. & Supply Co.....
.....New York.

AIR PUMPS AND APPLIANCES.
Fore River Ship & Engine Co.....
.....Quincy, Mass.
Great Lakes Engineering Works....
.....Detroit.

ANCHORS.
Bowers, L. M. & Co.....
.....Binghamton, N. Y.

ANTI-FRICTION METALS.
Cramp, Wm. & Sons....Philadelphia.

ARTIFICIAL DRAFT FOR BOILERS.
American Ship Building Co.....
.....Cleveland.
Detroit Ship Building Co....Detroit.
Great Lakes Engineering Works....
.....Detroit.

ASH EJECTORS.
Great Lakes Engineering Works....
.....Detroit.

ATTORNEYS AND PROCTORS IN ADMIRALTY.
Gilchrist, Albert J.....Cleveland.
Goulder, Holding & Masten.....
.....Cleveland.
Hoyt, Dustin & Kelley....Cleveland.
Jenkins, Russell & Eichelberger....
.....Cleveland.
Kremer, C. E.....Chicago.
MacDonald, Ray G.....Chicago.
Maytham, Frank.....Buffalo.
Shaw, Warren, Cady & Oakes.....
.....Detroit.
White, Johnson, McCaslin & Cannon
.....Cleveland.

BAROMETERS, MARINE GLASSES, ETC.
Ritchie, E. S. & Sons.....
.....Brookline, Mass.

BLOCKS, SHEAVES, ETC.
Boston Lockport Block Co.....
.....Boston, Mass.

BLOWERS.
American Blower Co., Detroit, Mich.

BOAT BUILDERS.
Drein, Thos. & Son.....
.....Wilmington, Del.
Kahnweiler's Sons, David.....
.....New York.
Truscott Boat Mfg. Co.....
.....St. Joseph, Mich.

BOILER COMPOUNDS.
The Bird-Archer Co.....New York
Dearborn Drug & Chemical Works..
.....Chicago.
Lake Erie Boiler Compound Co.....
.....Buffalo.
State Manufacturing Co...Cleveland.

BOILER MANUFACTURERS.
Almy Water Tube Boiler Co.....
.....Providence, R. I.
American Ship Building Co.....
.....Cleveland.
Atlantic Works..East Boston, Mass.
Briggs, Marvin.....New York.
Chicago Ship Building Co..Chicago.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co....Detroit.
Fletcher, W. A. & Co.....
.....Hoboken, N. J.
Fore River Shipbuilding Co.....
.....Quincy, Mass.
Great Lakes Engineering Works....
.....Detroit.
Kingston Foundry & Machine
WorksOswego, N. Y.
Lake Erie Boiler Wks.....Buffalo
Maryland Steel Co.....
.....Sparrow's Point, Md.
McLaughlin Iron Wks ..Ashtabula, O.
Milwaukee Dry Dock Co.....
.....Milwaukee.
Mosher Water Tube Co..New York.
Newport News Ship Building Co..
.....Newport News, Va.
New York Shipbuilding Co.....
.....Camden, N. J.
Northwestern Steam Boiler & Mfg.
Co.....Duluth, Minn.
Quintard Iron Works Co.....
.....New York.
Roberts Safety Water Tube Boiler
Co.New York.
Superior Ship Building Co.....
.....Superior, Wis.
Taylor Water Tube Boiler Co....
.....Detroit.
Toledo Ship Building Co.....Toledo.

BOILER RIVETS.
Bourne-Fuller Co.....Cleveland.
**BOILER STAYBOLTS, IRON OR
STEEL, HOLLOW OR
SOLID.**
Falls Hollow Staybolt Co.....
.....Cuyahoga Falls, O.

BRASS AND BRONZE CASTINGS.
Cramp, Wm. & Sons....Philadelphia.
Fore River Ship & Engine Co.....
.....Quincy, Mass.
Great Lakes Engineering Works..
.....Detroit.
Lunkenheimer Co.....Cincinnati.

BRIDGES, BUILDERS OF.
Scherzer Rolling Lift Bridge Co...
.....Chicago.

BUCKETS, ORE AND COAL.
Brown Hoisting & Conveying Ma-
chine Co.....Cleveland.
G. H. Williams Co.....Cleveland.

**CABIN AND CABINET
FINISHING WOODS.**
Martin-Barriss Co.....Cleveland.

CANVAS SPECIALTIES.
Baker & Co., H. H.....Buffalo.
Bunker, E. A.....New York.
Upson-Walton Co.....Cleveland.

CAPSTANS.
American Ship Windlass Co.....
.....Providence, R. I.
Dake Engine Co.....
.....Grand Haven, Mich.

Hyde Windlass Co.....Bath, Me.
Marine Mfg. & Supply Co.....
.....New York.

**CEMENT, IRON FOR REPAIR-
ING LEAKS.**
Smooth-On Mfg. Co.....
.....Jersey City, N. J.

CHAIN SURVEYORS, HOISTS.
Brown-Hoisting Machinery Co.....
.....Cleveland.
General Electric Co.....
.....Schenectady, N. Y.

CHAIN HOISTS.
Boston & Lockport Block Co.....
.....Boston, Mass.

CHARTS.
Penton Publishing Co....Cleveland.

CHECK VALVES.
Scoville Check Valve Co., Ashtabula, O.

**CLOCKS (Marine and Ship's Bell)
AND CHRONOMETERS.**
Ritchie, E. S. & Sons.....
.....Brookline, Mass.

CLOTHING, WATERPROOF.
Armstrong, E. A. Mfg. Co...Chicago.

**COAL PRODUCERS AND
SHIPPERS.**
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co....Cleveland.
Pittsburg Coal Co.....Cleveland

**COAL AND ORE HANDLING
MACHINERY.**
Brown-Hoisting Machinery Co.....
.....Cleveland.

COMPASSES.
Ritchie, E. S. & Son.....
.....Brookline, Mass.

CONDENSERS.
Great Lakes Engineering Works....
.....Detroit.
Wheeler Condenser & Engineering
Co.....New York.

**CONTRACTORS FOR PUBLIC
WORKS.**

Breyman Bros., G. H.....Toledo.
Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co....
.....Buffalo.
Great Lakes Dredge & Dock Co....
.....Chicago.
Hickler Bros.....
.....Sault Ste. Marie, Mich.
Hubbell Co., H. W..Saginaw, Mich.
Smith Co., L. P. & J. A...Cleveland.
Starke Dredge & Dock Co., C. H...
.....Milwaukee.
Standard Contracting Co..Cleveland.
Sullivan, M.....Detroit.

CORDAGE.
Baker & Co., H. H.....Buffalo.
Upson-Walton Co.....Cleveland.

Hickler Brothers

SAULT STE. MARIE, MICH.

MARINE RAILWAY

Capacity, 1,000 tons. Draft, 7½ ft. forward, 13½ ft. aft. Length on keel blocks, 180 ft.; over all, 190 ft.

Machine Shop, Foundry and Steam Forge,
Dredges, Drill Boats and Derrick Scows.

G. H. Breymann & Bro's

CONTRACTORS FOR PUBLIC WORKS

Dredging, Dock Building, Etc.

5, 6 AND 7 MARINE BUILDING
TOLEDO, OHIO.

Great Lakes Dredge & Dock Company

RIVER AND HARBOR IMPROVEMENTS

Foundations, Bridges, Piers, Breakwaters,
Lighthouses, Tunnels, Pneumatic
and Submarine Work.

CHICAGO

DULUTH

CLEVELAND

TOLEDO

SAULT STE. MARIE

Dunbar and Sullivan DREDGING Company

BUFFALO, N. Y.

REMOVE SUBMARINE
ROCK OR EARTH

Buffalo Dredging Co.

GENERAL CONTRACTORS
ON
SUBMARINE WORK

Office
D. S. Morgan Bldg.

BUFFALO, N. Y.

CATALOGS WANTED.

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Do not delay to send them and note the address is

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H. W. HUBBELL CO.

Submarine Work
of all kinds

Dredging Hard Material a Specialty.

SAGINAW

MICH.

Buyers' Directory of the Marine Trade.—Continued.

CORK JACKETS AND RINGS.

Armstrong Cork Co., Pittsburg, Pa.
Kahnweiler's Sons, D., New York.

CRANES, TRAVELING.

Brown-Hoisting Machinery Co., ..
..... Cleveland.

DIVING APPARATUS.

Morse, A. J. & Son, .. Boston.
Schrader's Son, Inc., A., New York.

DREDGING CONTRACTORS.

Breymann & Bros., G. H., Toledo.
Buffalo Dredging Co., .. Buffalo.
Dunbar & Sullivan Dredging Co., ..
..... Buffalo.
Great Lakes Dredge & Dock Co., ..
..... Chicago.
Hickler Bros., .. Sault Ste. Marie, Mich.
Hubbell Co., H. W., Saginaw, Mich.
Starke Dredge & Dock Co., C. H., ..
..... Milwaukee.
Sullivan, M., .. Buffalo.

DREDGING MACHINERY.

Quintard Iron Works Co., New York.
Superior Iron Works, .. Superior, Wis.

DRY DOCKS.

American Ship Building Co., ..
..... Cleveland.
Atlantic Works, .. East Boston, Mass.
Buffalo Dry Dock Co., .. Buffalo.
Chicago Ship Building Co., ..
..... Chicago.
Cramp, Wm. & Sons, Philadelphia.
Detroit Ship Building Co., ..
..... Detroit.
Great Lakes Engineering Works, ..
..... Detroit.
Lockwood Mfg. Co., .. East Boston, Mass.
Milwaukee Dry Dock Co., .. Milwaukee.
Newport News Ship Building Co., ..
..... Newport News, Va.
Shipowners' Dry Dock Co., Chicago.
Superior Ship Building Co., ..
..... Superior, Wis.
Tietjen & Lang Dry Dock Co., ..
..... Hoboken, N. J.
Toledo Ship Building Co., .. Toledo.

DYNAMOS.

General Electric Co., ..
..... Schenectady, N. Y.

ELECTRIC HOISTS AND CRANES.

General Electric Co., ..
..... Schenectady, N. Y.

ELECTRIC LIGHT AND POWER PLANTS.

General Electric Co., ..
..... Schenectady, N. Y.

ENGINE BUILDERS, MARINE.

American Blower Co., Detroit, Mich.
American Ship Building Co., ..
..... Cleveland.
Atlantic Works, East Boston, Mass.
Briggs, Marvin, .. New York.
Chicago Ship Building Co., Chicago.
Chase Machine Co., .. Cleveland.
Cramp, Wm. & Sons, Philadelphia.
Detroit Ship Building Co., Detroit.
Fletcher, W. & A. Co., Hoboken, N. J.
Fore River Shipbuilding Co., ..
..... Quincy, Mass.
Great Lakes Engineering Works, ..
..... Detroit, Mich.
Hall Bros., .. Philadelphia.

ENGINE BUILDERS—Continued.

Lockwood Mfg. Co., .. East Boston, Mass.
Maryland Steel Co., .. Sparrows Point, Md.
Milwaukee Dry Dock Co., Milwaukee.
Mosher, Chas. D., .. New York.
Newport News Ship Building Co., ..
..... Newport News, Va.
New York Ship Building Co., ..
..... Camden, N. J.
Northwestern Steam Boiler & Mfg.
Co., .. Duluth, Mich.
Quintard Iron Works Co., New York.
Roach's Ship Yard, .. Chester, Pa.
Sheriffs Mfg. Co., .. Milwaukee.
Superior Ship Building Co., ..
..... Superior, Wis.
Thropp, J. E. & Sons Co., ..
..... Trenton, N. J.
Toledo Ship Building Co., .. Toledo.
Trout, H. G., .. Buffalo.

ENGINE ROOM TELEGRAPH CALL BELLS, ETC.

Cory, Chas. & Son, .. New York.
Marine Mfg. Supply Co., New York.

ENGINEERING SPECIALTIES AND SUPPLIES.

Lunkenheimer Co., .. Cincinnati.
Northwestern Steam Boiler & Mfg.
Co., .. Duluth, Minn.

ENGINEERS, MARINE, MECHANICAL, CONSULTING.

Furstenau, M. C., .. Philadelphia.
Hynd, Alexander, .. Cleveland.
Hunt, Robt. W. & Co., .. Chicago.
Kidd, Joseph, .. Duluth, Minn.
Mosher, Chas. D., .. New York.
Nacey, James, .. Cleveland.
Roelker, H. B., .. New York.
Wood, W. J., .. Chicago.

FANS.

American Blower Co., Detroit, Mich.

FEED WATER PURIFIERS AND HEATERS.

Ross Valve Co., .. Troy, N. Y.
Wheeler Condenser & Engineering
Co., .. New York.

FIXTURES FOR LAMPS, OIL OR ELECTRIC.

General Electric Co., ..
..... Schenectady, N. Y.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co., ..
..... Cleveland.
Fore River Shipbuilding Co., ..
..... Quincy, Mass.

FLUE WELDING.

Fix's S. Sons, .. Cleveland.

FUELING COMPANIES AND COAL DEALERS.

Hanna, M. A. & Co., .. Cleveland.
Parker Bros. Co., Ltd., .. Detroit.
Pickands, Mather & Co., Cleveland.
Pittsburg Coal Co., .. Cleveland.
Smith, Stanley B., & Co., Detroit.
Toledo Fuel Company, .. Toledo, O.

FURNACES FOR BOILERS.

Continental Iron Works, New York.

GAS BUOYS.

Safety Car Heating & Lighting Co., ..
..... New York.

GAS AND GASOLINE ENGINES.

Chase Machine Co., .. Cleveland.

GAUGES, STEAM AND VACUUM.

Lunkenheimer Co., .. Cincinnati.

GAUGES, WATER.

Lunkenheimer Co., .. Cincinnati, O.

GENERATING SETS.

General Electric Co., ..
..... Schenectady, N. Y.

GRAPHITE.

Dixon Crucible Co., Joseph, ..
..... Jersey City, N. J.

HAMMERS, STEAM.

Chase Machine Co., .. Cleveland.

HEATING AND VENTILATING APPARATUS.

American Blower Co., Detroit, Mich.

HOISTS FOR CARGO, ETC.

American Ship Building Co., ..
..... Cleveland.
Brown Hoisting Machinery Co., ..
..... Cleveland.
Chase Machine Co., .. Cleveland.
Dake Engine Co., .. Grand Haven, Mich.
General Electric Co., .. New York.
Hyde Windlass Co., .. Bath, Me.
Marine Iron Co., .. Bay City.

HOLLOW STAYBOLT IRON.

Falls Hollow Staybolt Co., ..
..... Cuyahoga Falls, O.

HYDRAULIC DREDGES.

Great Lakes Engineering Works, ..
..... Detroit.

HYDRAULIC TOOLS.

Watson-Stillman Co., The, ..
..... New York.

ICE MACHINERY.

Great Lakes Engineering Works, ..
..... Detroit.
Roelker, H. B., .. New York.

INJECTORS.

American Injector Co., .. Detroit.
Jenkins Bros., .. New York.
Lunkenheimer Co., .. Cincinnati.
Penberthy Injector Co., ..
..... Detroit, Mich.

INSURANCE, MARINE.

Atlantic Mutual Insurance Co., ..
..... New York.
Belcher, Fred P., .. Winnipeg.
Elphicke, C. W. & Co., .. Chicago.
Gilchrist & Co., C. P., .. Cleveland.
Hawgood & Co., W. A., Cleveland.
Helm & Co., D. T., .. Duluth.
Hutchinson & Co., .. Cleveland.
McCarthy, T. R., .. Montreal.
McCurdy, Geo. L., .. Chicago.
Mitchell & Co., .. Cleveland.
Parker Bros. Co., Ltd., .. Detroit.
Peck, Chas. E. & W. F., ..
..... New York and Chicago.
Prindiville & Co., .. Chicago.
Richardson, W. C., .. Cleveland.
Sullivan, D. & Co., .. Chicago.
Vance & Joys Co., .. Milwaukee.

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DREDGING OF ALL KINDS

THE REMOVING OF DEEP
WATER EARTH AND ROCK
A SPECIALTY. - - -

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BUFFALO, - - - N. Y.

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ing, Concrete, Submarine work, &c.

Wade Building

Cleveland, Ohio

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DREDGING, PILE DRIVING,
—AND—
SUBMARINE PIPE LAYING.

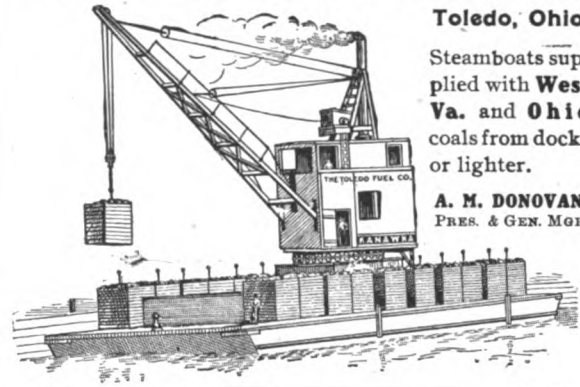
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Milwaukee, - - Wisconsin.

The Toledo Fuel Co.

Toledo, Ohio

Steamboats sup-
plied with **West**
Va. and **Ohio**
coals from docks
or lighter.

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PRES. & GEN. MGR.

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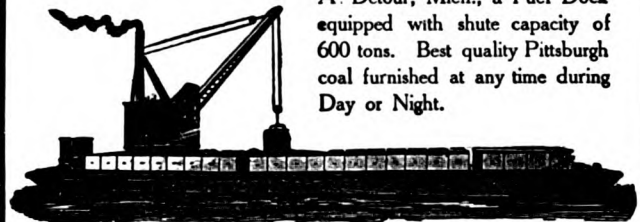
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of all grades of**Oakum**Spun
Cotton

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FUEL LIGHTERS at Buffalo, Erie, Ashtabula and Cleveland.

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equipped with shute capacity of
600 tons. Best quality Pittsburgh
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Day or Night.



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THE COLUMBUS FLYER

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—ENGINEERS—

Popular among young men in the engine departments of ships is
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Sells at \$2.00, which is the cost delivered, of the following works:

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Hawkins' Maxims and Instructions for the Boiler Room.
Hawkins' Hand Book of Calculations for Engineers.
Hawkins' New Catechism of the Steam Engine.

THE MARINE REVIEW, CLEVELAND.

Buyers' Directory of the Marine Trade---Continued.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland, O.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co., Cleveland.

LAUNCHES—STEAM, NAPHTHA, ELECTRIC.

Truscott Boat Mfg. Co.....
.....St. Joseph, Mich.

LIFE PRESERVERS, LIFE BOATS, BUOYS.

Armstrong Cork Co.....Pittsburg.
Carley Life Float Co.....
.....New York, N. Y.
Drein, Thos. & Son.....
.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LOGS.

Nicholson Ship Log Co., Cleveland.
Walker & Sons, Thomas.....
.....Birmingham, Eng.

LUBRICATING GRAPHITE.

Dixon Crucible Co., Joseph.....
.....Jersey City, N. J.

LUBRICATORS.

Lunkenheimer Co. Cincinnati.

LUMBER.

Martin-Barriss Co. Cleveland.

MACHINISTS.

Chase Machine Co.....Cleveland.
Hickler Bros., Sault Ste. Marie, Mich.
Lockwood Mfg. Co.....
.....East Boston, Mass.
McLaughlin Iron Works, Ashtabula, O.
Superior Iron Works, Superior, Wis.

MACHINE TOOLS (WOOD WORKING).

Atlantic Works, Inc....Philadelphia.

MARINE RAILWAYS

Hickler Bros., Sault Ste. Marie, Mich.

MARINE RAILWAYS, BUILDERS OF,

Crandall & Son, H. I.....
.....East Boston, Mass.

MARINE TORCHES.

Marine Torch Co.....Baltimore.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York

MECHANICAL DRAFT FOR BOILERS.

American Blower Co.....Detroit.
American Ship Building Co.....
.....Cleveland.
Detroit Ship Building Co., Detroit.
Great Lakes Engineering Works....
.....Detroit.

METALLIC PACKING.

Katzenstein, L. & Co., New York.

MOTORS, GENERATORS—ELECTRIC.

General Electric Co.....
.....Schenectady, N. Y.

NAUTICAL INSTRUMENTS.

Ritchie, E. S., & Sons.....
.....Brookline, Mass.

NAVAL ARCHITECTS.

Curr, RobertCleveland
Hynd, AlexanderCleveland
Kidd, JosephDuluth, Minn.
Mosher, Chas. D.....New York.
Nacey, JamesCleveland
Wood, W. J.....Chicago

OAKUM.

Stratford, Oakum Co.....
.....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....
.....Jersey City, N. J.

PACKING.

Jenkins Bros.....New York.
Katzenstein, L. & Co..New York.
Robertson, Jos. L. & Sons.....
.....New York.

PAINTS.

Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

PATTERN SHOP MACHINERY.

Atlantic Works, Inc. ..Philadelphia.

PILE DRIVING AND SUBMARINE WORK.

Buffalo Dredging Co.....Buffalo.
Dunbar & Sullivan Dredging Co....
.....Buffalo.
Great Lakes Dredge & Dock Co....
.....Chicago.
Hickler Bros., Sault Ste. Marie, Mich.
Hubbell Co., H. W...Saginaw, Mich.
Parker Bros. Co., Ltd.....Detroit.
Starke Dredge & Dock Co., C. H...
.....Milwaukee.
Sullivan, M.....Detroit.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland, O.

PLANING MILL MACHINERY.

Atlantic Works, Inc....Philadelphia.

PLATES—SHIP, STRUCTURAL, ETC.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

PRESSURE REGULATORS.

Ross Valve Co.....Troy, N. Y.

PROPELLER WHEELS.

American Ship Building Co.....
.....Cleveland.
Atlantic Works ..East Boston, Mass.
Cramp, Wm. & Sons..Philadelphia.
Detroit Ship Building Co.....Detroit.
Fore River Shipbuilding Co.....
.....Quincy, Mass.
Great Lakes Engineering Works....
.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lockwood Mfg. Co.....
.....East Boston, Mass.
Milwaukee Dry Dock Co.....
.....Milwaukee.
Newport News Ship Building Co..
.....Newport News, Va.
Roelker, H. B.....New York.
Sheriffs Mfg. Co.....Milwaukee.
Superior Ship Building Co.....
.....Superior, Wis.
Thropp & Sons Co., J. E.....
.....Trenton, N. J.
Toledo Ship Building Co.....Toledo.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.

General Electric Co.....
.....Schenectady, N. Y.

PUMPS FOR VARIOUS PURPOSES.

Great Lakes Engineering Works..
.....Detroit.
Kingsford Foundry & Machine
WorksOswego, N. Y.
Wheeler Condenser & Engineering
Co.New York.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.

Great Lakes Register.....Cleveland.

RIVETS, STEEL FOR SHIPS AND BOILERS.

Bourne-Fuller Co.....Cleveland, O.
Great Lakes Engineering Works....
.....Detroit.

SAFETY VALVES.

Lunkenheimer Co.....Cincinnati.

SAIL MAKERS.

Baker, Howard H. & Co....Buffalo.
Upson-Walton Co.....Cleveland.

SALVAGE COMPANIES.

See Wrecking Companies.

SEARCH LIGHTS.

General Electric Co.....
.....Schenectady, N. Y.

SHEARS.

See Punches, and Shears.

SHIP AND BOILER PLATES AND SHAPES.

Bourne-Fuller Co.....Cleveland, O.
Otis Steel Co.....Cleveland.

SHIP BUILDERS.

American Ship Building Co.....
.....Cleveland.
Atlantic Works ..East Boston, Mass.
Buffalo Dry Dock Co.....Buffalo.
Collingwood Shipbuilding Co.....
.....Collingwood, Ont.
Cramp, Wm. & Sons..Philadelphia
Chicago Ship Building Co..Chicago.
Detroit Ship Building Co....Detroit
Fore River Ship Building Co.....
.....Quincy, Mass
Great Lakes Engineering Works....
.....Detroit.
Lockwood Mfg. Co.....
.....East Boston, Mass.
Maryland Steel Co.....
.....Sparrow's Point, Md.
Milwaukee Dry Dock Co.....
.....Milwaukee.
Newport News Ship Building Co..
.....Newport News, Va.
New York Shipbuilding Co.....
.....Camden, N. J.
Roach's Ship Yard....Chester, Pa.
Shipowner's Dry Dock Co..Chicago.
Toledo Ship Building Co.....Toledo.

SHIP CHANDLERS.

Baker, Howard H. & Co....Buffalo.
Marine Mfg. & Supply Co.....
.....New York
Upson-Walton Co.....Cleveland.

SHIP DESIGNERS.

Kidd, JosephDuluth.
Steel, Nacey, & Hynd....Cleveland
Wood, W. J.....Chicago.

SHIP FLOORING.

Clemente, The C., Co....Cleveland.

Charts for Sailormen

We carry in stock a complete line of mariners' charts covering nearly every waterway on the globe. They are bound (backed if desired) in pure linen and practically indestructible. Printed in colors. Mailed anywhere on earth

Here is the list of charts for the Great Lakes. Glance them over and see if you need any of them.

NAMES OF CHARTS

LAKE ONTARIO

Lake Ontario
St. Lawrence River Nos. 1, 2, 3 4, 5, 6
Coast-Charts Nos. 1, 2, 3, 4, 5
Oswego Harbor
Little Sodus Bay
Great Sodus Bay
Charlotte Harbor
Niagara Falls

LAKE ERIE

Lake Erie
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7
Detroit River
Lake St. Clair
St. Clair River
Buffalo Harbor and Niagara River
Dunkirk Harbor
Erie Harbor and Presque Isle
Conneaut Harbor
Ashtabula Harbor
Fairport Harbor
Cleveland Harbor
Lorain Harbor
Huron Harbor
Sandusky Bay
Maumee Bay and Maumee River

LAKE HURON

Lake Huron and Georgian Bay
South End of Lake Huron
Saginaw Bay
Straits of Mackinac
Coast-Charts Nos. 5, 6, 7, 8
Sand Beach Harbor of Refuge
Saginaw River
Tawas Harbor
Thunder Bay
Presque Isle and Middle Island
St. Marys River Nos. 1, 2, 3
St. Joseph Channel and Western End of North Channel

LAKE MICHIGAN

Lake Michigan
North End of Lake Michigan

South End of Lake Michigan
Beaver Island Group
Grand and Little Traverse Bays
Coast-Charts Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9
South End of Green Bay
North End of Green Bay
Manistique Harbor
Charlevoix Harbor
South Fox Island Shoals
Manitou Passage
Frankfort Harbor
Manistee Harbor
Ludington Harbor
Muskegon Harbor
Harbor at Michigan City
Lake Front, Chicago
Milwaukee Harbor
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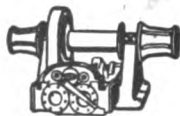
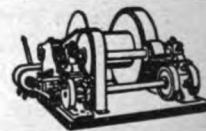
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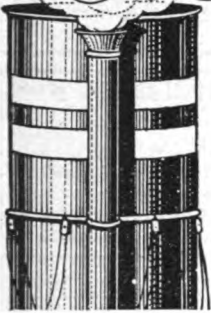
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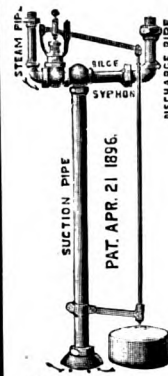
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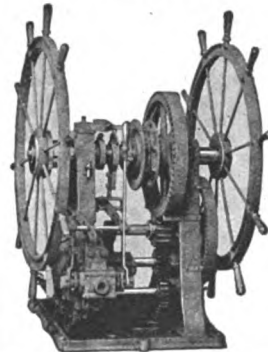
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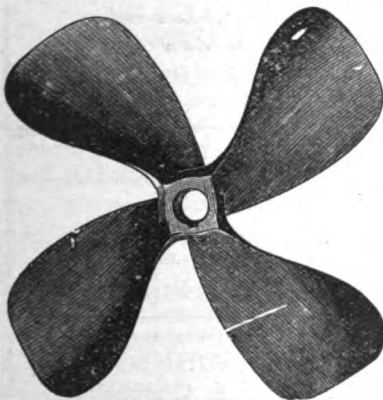
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American Line.....	48	Dunbar & Sullivan Dredging Co.	39	Lockwood Mfg. Co.....	50	Roberts Safety Water-Tube	
American Ship Building Co.....	4			Lukenheimer Co.....	3	Boiler Co.....	11
American Ship Windlass Co.....	4					+Robertson, Jas. L. & Sons	
*Armstrong Manufacturing Co.....	11	Elphicke, C. W. & Co.....	46			Roelker, H. B.....	50
Armstrong, A. E. Mfg. Co.....	52	*Emerson, Shoe Co.....	50	Maytham, Frank.....	46	Ross Valve Co.....	5
Armstrong, Cork Co.....	52	Errie Railroad.....	—	McCarthy, T. R.....	46	Safety Car Heating & Lighting Co	5
†Ashton Valve Co.....	—	Falls Hollow Staybolt Co.....	45	McCurdy, Geo. L.....	35	Scherzer Rolling Lift Bridge Co.	45
Atlantic Mutual Ins. Co.....	36	Fix's, S. Sons.....	50	McLaughlin Iron Works.....	87	Schrader's, A. Son, Inc.....	50
Atlantic Works.....	49	Fletcher, W. & A., Co.....	49	MacDonald, Ray G.....	46	*Scoville Check Valve Co.....	46
†Atlantic Works, Inc.....	—	Fogg, M. W.....	50	Mallory Line.....	48	Shaw, Warren, Cady & Oakes.....	46
		Fore River Ship Building Co.....	49	*Marine Iron Co., Bay City, Mich.	—	*Shelby Steel Tube Co.....	—
Baker, Howard H. & Co.....	52	Furstenau, M. C.....	47	*Marine Mfg. & Supply Co.....	45	*Sheriffs Mfg Co.....	45
Belcher, Fred P.....	46			Marine Torch Co., The.....	45	Shipping World Year Book.....	47
Big Four Ry.....	41	General Electric Co.....	52	Martin-Barriss Co.....	49	*Shipowners' Dry Dock Co.....	47
Billett, T. R.....	46	Gilchrist, Albert J.....	46	Maryland Steel Co.....	10	Siggers & Siggers.....	47
Boland, J. J.....	46	*Goldschmidt, Thermit Co.....	46	Milwaukee Dry Dock Co.....	5	Smith, Stanley B. Coal & Dock Co.	3
*Boston & Lockport Block Co.....	—	Gould, Holding & Masten.....	46	Mitchell & Co.....	46	Smooth-Roll Mfg. Co.....	51
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*Bourne-Fuller Co.....	45	Great Lakes Dredge & Dock Co.	39	Mosher Water-Tube Boiler Co.....	37	Starko, C. H., Dredge & Dock Co.	41
Bowers, L. M. & Co.....	52	Great Lakes Engineering Works.....	12			*State Manufacturing Co.....	41
Braender, Philip.....	45	Great Lakes Register.....	—			Stratford, Geo., Oakum Co.....	41
Breyman, G. H. & Bros.....	39	*Great Lakes Towing Co.....	36	Nacey & Hynd.....	47	*Submarine Signal Company.....	41
Briggs, Marvin.....	36	Hall, John B.....	46	Newport News Ship Building &	6	Sullivan, M.....	41
†Brown Hoisting Machinery Co.....	—	Hanna, M. A., & Co.....	37	Dry Dock Co.....	6	Sullivan, D. & Co.....	46
Buffalo Dredging Co.....	39	Hawgood, W. A. & Co.....	46	New York & Cuba Mail S. S. Co.	48	*Superior Iron Works.....	4
Buffalo Dry Dock Co.....	5	Helm, D. T., & Co.....	46	New York Shipbuilding Co.....	7	Superior Ship Building Co.....	4
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*Carley Life Float Co.....	—	Holmes, Samuel.....	46	Northwestern Steam Boiler &	37	Tietjen & Lang Dry Dock Co.....	50
Chase-Machine Co.....	44	Hoyt, Dustin & Kelley.....	46	Mfg. Co.....	37	Toledo Fuel Co.....	41
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Chicago Ship Building Co.....	4	Hunt, Robert W., & Co.....	47			Trout, H. G.....	45
Clement, T. C., Co.....	49	Hutchinson & Co.....	46			Truscott Boat Mfg. Co.....	2
Cleveland City Forge & Iron Co.....	51	Hyde Windlass Co.....	35			Upson-Walton Co.....	52
*Collingwood Shipbuilding Co.....	—					Vance & Joys Co.....	46
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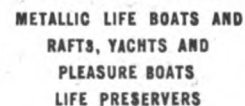
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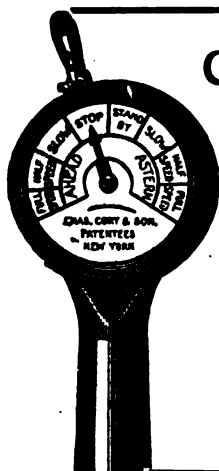


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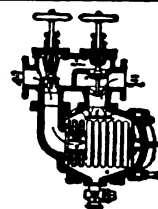
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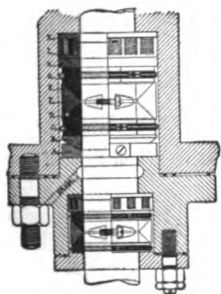
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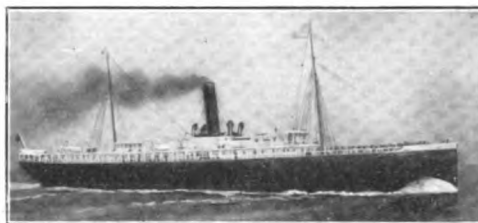
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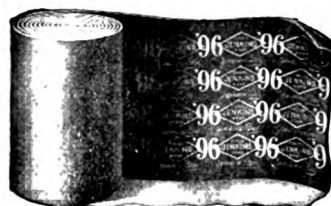
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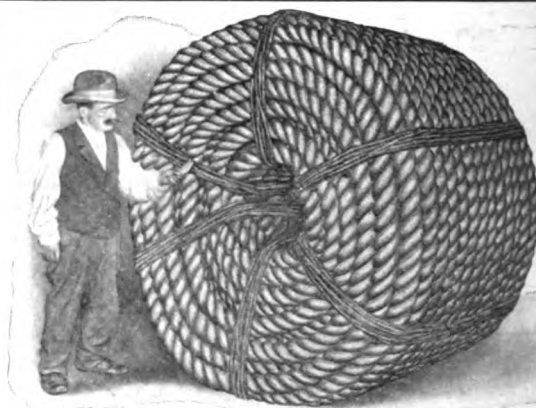
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